CHAPTER 10

Records

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Fundamental to good management of a captive flock is keeping detailed records of important life history events and genealogy. The knowledge of family relationships is essential to genetic management in long-term captive breeding programs. Record keeping systems should organize and store this information in an easily accessible format.This allows evaluation of current andhistorical management practices. Standardization of data collection and reporting between centers can increase effective sample size and simplify data analysis.

Crane record keeping systems have been evolving at Patuxent since 1966 and at ICF since 1974 (Ellis et al. 1991). A detailed description of Patuxent's manual (non-computerized) system is available in published form (Ellis et al. 1991) and examples of the most recent data forms are available from the authors. Herein we outline the information that we consider essential for the long-term management of a captive crane colony. We also include information that will be helpful for some collections involved with more specialized uses. Our presentation is of a manual system (Fig. 10.1) organized to allow for limited redundancy while promoting ready access to each form. We have included Patuxent's form sheets (Figs. 10.2-10.13) and information cells (IC's) to provide useful information from other systems (cited later) and our own observations.

ARKS and Other Computerized Records Systems

The need for a complex computerized records system for general use by many institutions was identified by the Committee on Laboratory Animal Records (1979). To facilitate the keeping of good records on animal colonies, several systems for efficiently maintaining specimen inventory, health, productivity, and vital records have appeared (Brown 1975; Seal and Makey 1975). Most widely used in the avicultural community is the computerized International Species Information System (ISIS) designed to promote uniform reporting of basic demographic information for individual specimens throughout the network of subscribing institutions (Seal et al. 1976, 1977). With over 460 institutions participating (1995), ISIS is rapidly becoming the most common animal record keeping system worldwide.

Animal Record Keeping SystemIII(ARKSIII)is the computersoftware providedtoISISparticipants (utilizinganIBMcompatiblemicrocomputerwithat least 512K RAMand a hard diskwith a minimumof10 megabytes).ARKSIIIenablesmaintenanceofaccurate up-to-date records. It isalsouserfriendly. TheARKSIII systemprovidesusefulsummary reportsandstatisticson currentinventory, births,deaths,andtransfers. Details ofeventsforindividualanimalsare notincluded,soitis oftendesirabletoaugmentthesystemwithmore detailed recordson reproduction,behavior, etc.

The inventory of a zoologicalfacility iseasily edited and checkedusingtheARKS III program. By merely selecting theISIS report functionandinserting a disk, thedata canbe transcribed ontothedisk and made readyformailing toISISor other institutions.This procedure allowsfor a regularlyupdated international inventory ofall individualsofany species(orother taxon)for all member institutions. Fromthis information,ISIS produces valuable taxon reports summarizingbasic genetic anddemographic information. Institutions canalsoeasily providediskette copies ofan individualanimal's record,allowingefficient transferofinformation whenan animalisshipped.

Information entered for each specimen is coded for easy retrieval of various reports. ARKS III is currently able to provide 12 reports which are useful for in-house management. They are as follows: Collection inventory; Specimen report; Taxon report; Transaction reports; Enclosure log; Reproductive history; Sibling tables; Pedigree (for animals within the institution); Inbreeding (local); Age pyramid; Fecundity and Mortality report; and International Zoo Yearbook (IZY) report.

ISIS has produced three other programs which aid in record keeping and data retrieval. MedARKS software provides medical records and reports for anesthesia, parasitology, clinical pathology, serum and tissue banking, text for clinical notes, and medication and vaccination records. There is flexibility in designing additional in-house modules. A pathology module is under development. MedARKS is a sufficiently complete system for medical records for a crane collection and is presently used that way at ICF.

SPARKS software enables coordinators of breeding programs to develop individual species studbooks and facilitates the management of breeding programs through genetic and demographic analyses and reports.

EGGS software, an egg log database, is currently under development. It will enable the complex reporting required for the management of a colony of breeding cranes. Currently functioning as relational databases, both MedARKS and EGGS cannot perform without up-to-date records in ARKS III.

Other computerized records systems are also available which can accommodate detailed information on productivity, health, and many life history events (e.g., Sciabbarrasi and London 1974) and can be used for management of veterinary data (e.g., Castleberry et al. 1966; SNOMED 1976, 1977).

The Patuxent Records System

The Patuxent records system is presented schematically in Fig. 10.1. In designing records, each form is given a descriptive title and is assigned a letter which is referred to in the text. Using the alphabetical designators, that figure serves as an index to the text.

The crane colonies at Patuxent and ICF are characterized by few species and many breeding adults. The breeding birds in our collections are often endangered species or subspecies. Because of the need to closely monitor all pertinent aspects of growth and productivity for each individual, other computerized records systems presently available do not fulfill all of these needs.

Below, we describe a manual system designed at Patuxent to record the detailed information we require for each bird. We will also provide some details of the ICF system where it differs significantly from the Patuxent system. The system can also be modified for use with smaller collections and for colonies of other avian species. We provide details on the use of the system including filing instructions and a table of appropriate responses for a sample of life history events. We indicate, for example, which records are created or modified when an egg is laid, a chick hatches, etc. The system is designed to allow for limited redundancy, for ease in manual filing and retrieval, and for ease in conversion to automated processing. Portions of the manual system have been automated in DOS and require an IBM compatible computer (minimum capacity 286) with 640K RAM. The automation process is continuing.

In designing the records listed on Fig. 10.1, we followed several conventions. First, to limit redundancy and for ease in record retrieval, whenever possible, use the individual identification number (ID, which also codes the leg band number in the Patuxent collection) as an index to all records where the specimen appears as an individual. In Patuxent's system, the ID also indicates the hatch year, so records filed by ID are also in chronological order. We recommend placing the year, taxon, and ID along the top or in the upper right corner of each form sheet. To avoid confusion in reporting reproductive success, we count all chicks reaching 70 days of age (hatch day is day 0) as fledged. Finally, we reserve a column on many forms for the initials (or name) of the person recording each entry. In some countries, this last provision is required by law for medical records.

In Fig. 10.1, the records are arranged from left to right chronologically by life history events. Individual and pair records are near the top followed by daily working records, summary records, planning records, and visual aids. Most of the records contain information about individual birds. Some, however, give readings from machines, and one, the Annual Time Line, provides a visual display of all regularly scheduled husbandry activities and the general phenology of the breeding season. Most of the records follow a highly structured format; an exception is the Daily Log. In all, 40 to 45 records and aids are treated in the narrative.

Individual and Pair Records

INDIVIDUAL FILE. A file, maintained for each adult crane, is created at fledging (70 days) when a Rearing Record (B, C) is closed and an Individual Log (R) is created. The file serves as a folder for all pertinent records on an individual. Records included in the file are the Individual Record (L), the Individual Log (R),

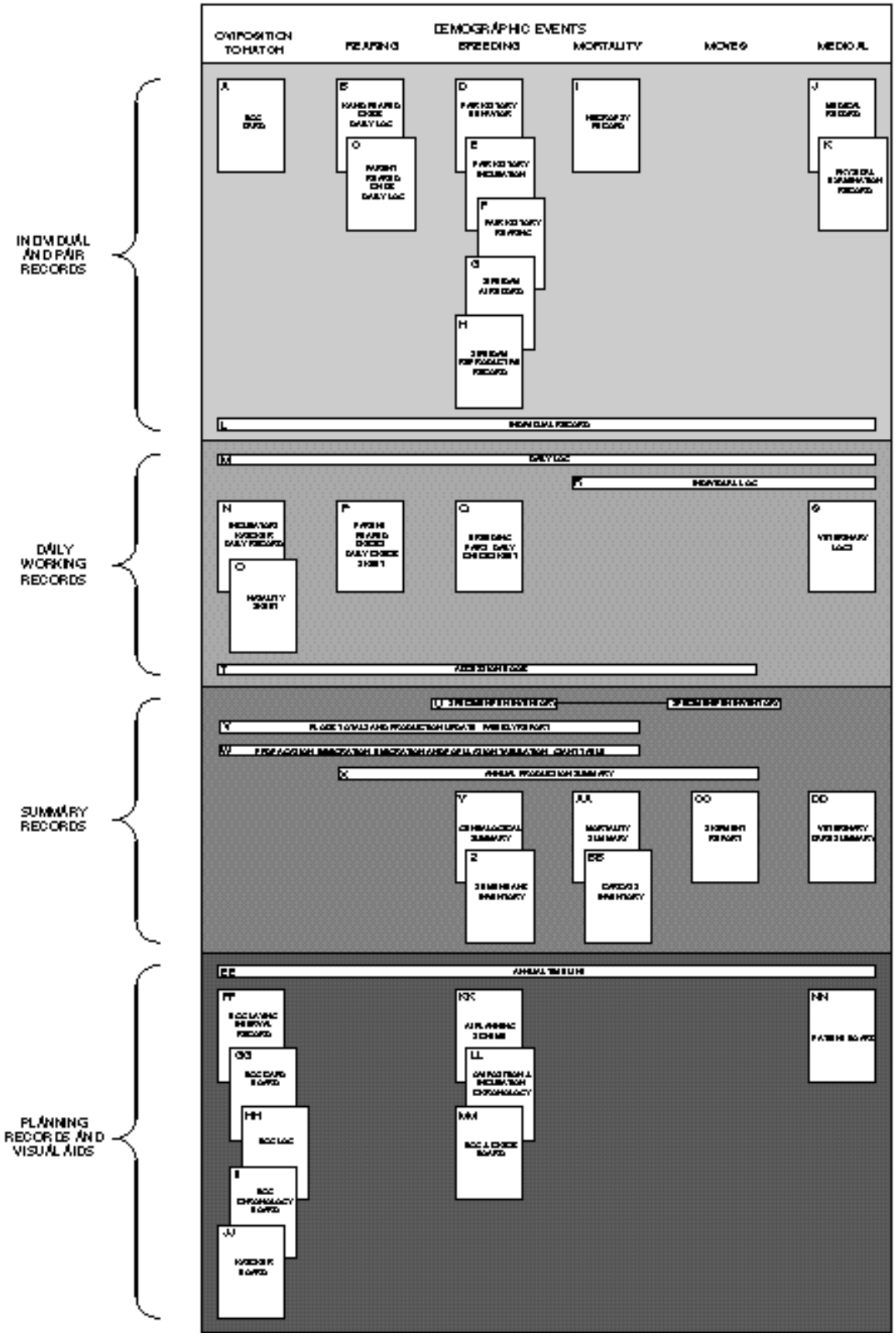


FIG. 10.1. *Schematic of records system.*

the Rearing Records (B, C), and the Genealogical Summary (Y). At Patuxent when an individual dies, all Medical Records (the Medical Record [J], the Physical Examination Record [K], and the Necropsy Record [I]) are transferred to the Individual File which is then transferred to the Mortality File. If an individual is transferred to another institution, all of the above records including breeding records are copied and transferred with the crane. The original file is then filed by taxon and ID, with files of other dispersed birds.

A. Egg Card. An Egg Card (Fig. 10.2) records all events from laying to hatching. The Egg Card is also used to record weight changes and to plot these against a normal weight loss curve so adjustments can be made in the incubation conditions. Hatching events are recorded on a separate Chick Hatching Record. Information recorded includes strength of calls and movements, and times of pip, rotation, and emergence. Abnormalities in position, egg waste, or the hatched chick are also noted. It is important to record the chick's ID number, tattoo, or name for reference on the Egg Card. Egg Cards are filed by year, taxon, and dam ID.

TAXON: FSHC DAM ID: 05-83035 YEAR: 1994
DATE LAID: 02/24 PEN: Y-44 EGG NO: 2
TIME FOUND: 0715 FOUND BY: JMN

FERTILITY: F IF UNK HATCHING DATE
EMBRYO COND.: ED MD LD PROJECTED: 03/26
DATE EXAMINED: 03/04 ACTUAL: 03/26
METHOD: CANDLED CHICK ID: 05-94002

EGG TRANSFERS

DATE	LOC. TO LOC.	COMMENTS (WEIGHT)
02/27	Y-44 to Petersime B	
02/28	Petersime B to R12	
03/10	R12 to Petersime B	
03/24	Petersime B to Hatcher A	

TAXON Florida SHC EGG ID Y44 #2 YEAR 1994

Date	Time	Hatching Comments	Initials
03/24	2130	Star pipped. Moved to Hatcher A	JMN
03/25	0740	Hole pip.	JT
	1630	Chick hatching; peeping strongly	MSE
03/26	0700	Hatched. Sprayed umbilicus with Betadine	KOM

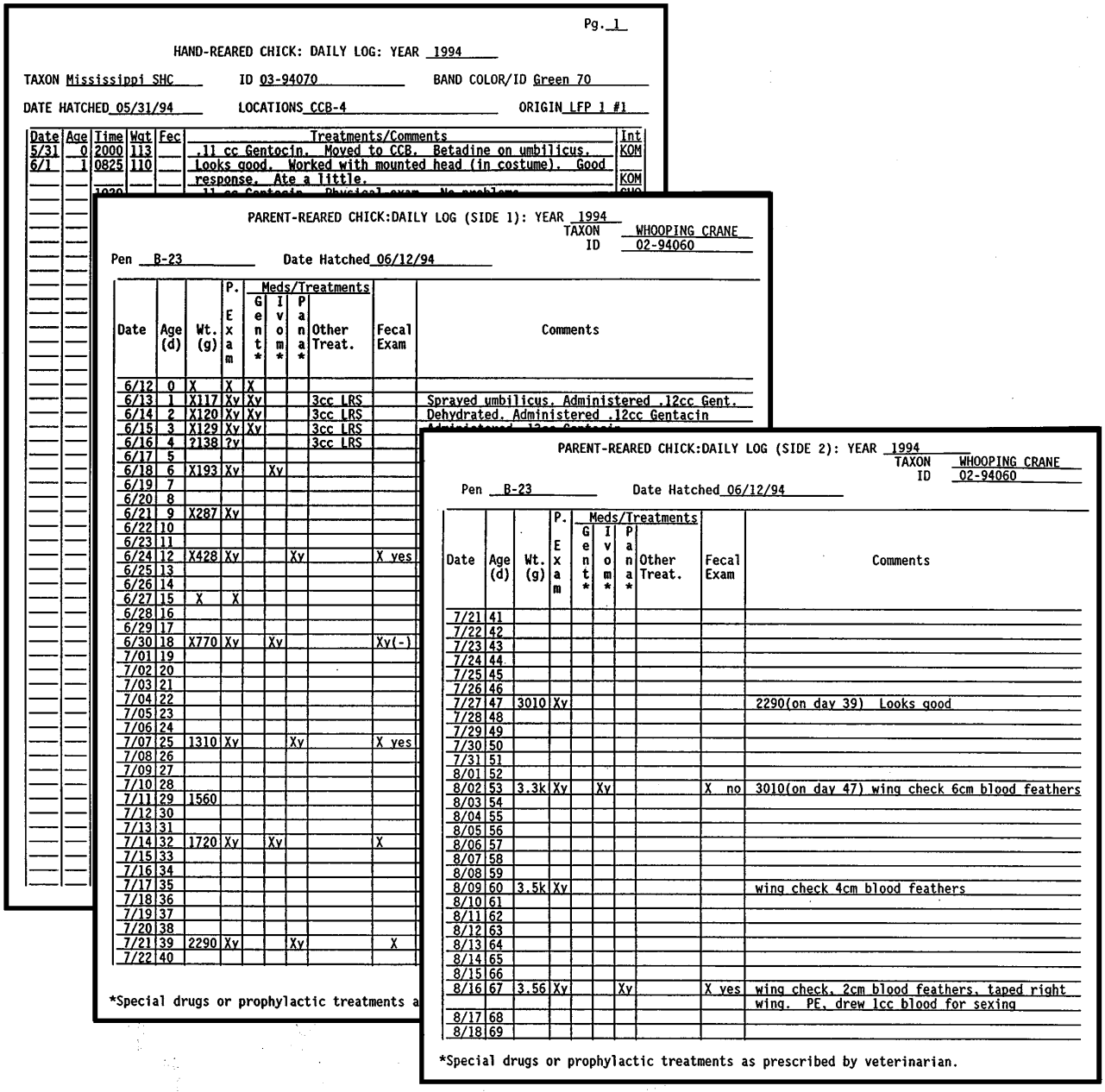
CHICK ID 05-94002

FIG. 10.2. *Two sides of the Egg Card, Form A.*

B. Hand-Reared Chick: Daily Log. Hand-reared chicks are weighed and inspected regularly. This record (Fig. 10.3), a running log on the progress of each chick through fledging, is posted on the door of the chick's pen. Weight gain is emphasized in this record because toe and leg deformities frequently result when growth is too rapid (Carpenter 1977, 1986). Data on physical condition, medical treatments, behavior, food consumption, hydration, socialization with other birds, and weight are recorded. Weight is also plotted against a normal weight change curve for the species and is used to decide if food withholding is necessary to decrease the likelihood of deformities. Once a chick has fledged, this record is transferred to the Individual File. Duplicate records may also be grouped by taxon and filed by year.

C. Parent Reared Chick: Daily Log. For many chicks reared by their own or foster parents, this record (Fig. 10.3) provides a running list of examinations, medical treatments, and behavioral observations through fledging. X's in the rows and columns of the form indicate the normal schedule for exams, treatments, and medications. Once the chick has fledged, this record is transferred to the Individual File which is filed by taxon and ID. These records may also be grouped and filed by year.

D. Pair History: Behavior. For some pairs, especially those of endangered species, detailed behavioral notes are made throughout the breeding season. As a minimum, a running log should be kept indicating the degree to which a pair behaves as a social unit. Included are annual notes on the general frequency of unison calling (Archibald 1976), the distance routinely maintained between birds, the presence or absence of key social and agonistic displays (Ellis et al. 1996) that indicate compatibility of mates, and peculiarities useful in signalling change in compatibility. Other behavior patterns useful in evaluating a pair are discussed in Chapter 6.



HAND-REARED CHICK: DAILY LOG: YEAR 1994

TAXON Mississippi SHC ID 03-94070 BAND COLOR/ID Green 70

DATE HATCHED 05/31/94 LOCATIONS CCB-4 ORIGIN LFP 1 #1

Date	Age	Time	Wgt	Fec	Treatments/Comments	Int
5/31	0	2000	113		.11 cc Gentocin. Moved to CCB. Betadine on umbilicus.	KOM
6/1	1	0825	110		Looks good. Worked with mounted head (in costume). Good response. Ate a little.	KOM

PARENT-REARED CHICK:DAILY LOG (SIDE 1): YEAR 1994

TAXON WHOOPING CRANE

ID 02-94060

Pen B-23 Date Hatched 06/12/94

Date	Age (d)	Wt. (g)	P. Exam	Meds/Treatments: Gent*	Ivom*	Pana*	Other Treat.	Fecal Exam	Comments
6/12	0	X	X	X					
6/13	1	X117	Xy	Xy			3cc LRS		Sprayed umbilicus. Administered .12cc Gent.
6/14	2	X120	Xy	Xy			3cc LRS		Dehydrated. Administered .12cc Gentacin
6/15	3	X129	Xy	Xy			3cc LRS		
6/16	4	?138	?y				3cc LRS		
6/17	5								
6/18	6	X193	Xy		Xy				
6/19	7								
6/20	8								
6/21	9	X287	Xy						
6/22	10								
6/23	11								
6/24	12	X428	Xy			Xy		X yes	
6/25	13								
6/26	14								
6/27	15	X	X						
6/28	16								
6/29	17								
6/30	18	X770	Xy		Xy			Xy(-)	
7/01	19								
7/02	20								
7/03	21								
7/04	22								
7/05	23								
7/06	24								
7/07	25	1310	Xy			Xy		X yes	
7/08	26								
7/09	27								
7/10	28								
7/11	29	1560							
7/12	30								
7/13	31								
7/14	32	1720	Xy		Xy			X	
7/15	33								
7/16	34								
7/17	35								
7/18	36								
7/19	37								
7/20	38								
7/21	39	2290	Xy			Xy		X	
7/22	40								

*Special drugs or prophylactic treatments a

PARENT-REARED CHICK:DAILY LOG (SIDE 2): YEAR 1994

TAXON WHOOPING CRANE

ID 02-94060

Pen B-23 Date Hatched 06/12/94

Date	Age (d)	Wt. (g)	P. Exam	Meds/Treatments: Gent*	Ivom*	Pana*	Other Treat.	Fecal Exam	Comments
7/21	41								
7/22	42								
7/23	43								
7/24	44								
7/25	45								
7/26	46								
7/27	47	3010	Xy						2290(on day 39) Looks good
7/28	48								
7/29	49								
7/30	50								
7/31	51								
8/01	52								
8/02	53	3.3k	Xy		Xy			X no	3010(on day 47) wing check 6cm blood feathers
8/03	54								
8/04	55								
8/05	56								
8/06	57								
8/07	58								
8/08	59								
8/09	60	3.5k	Xy						wing check 4cm blood feathers
8/10	61								
8/11	62								
8/12	63								
8/13	64								
8/14	65								
8/15	66								
8/16	67	3.56	Xy			Xy		X yes	wing check, 2cm blood feathers, taped right wing. PE, drew 1cc blood for sexing
8/17	68								
8/18	69								

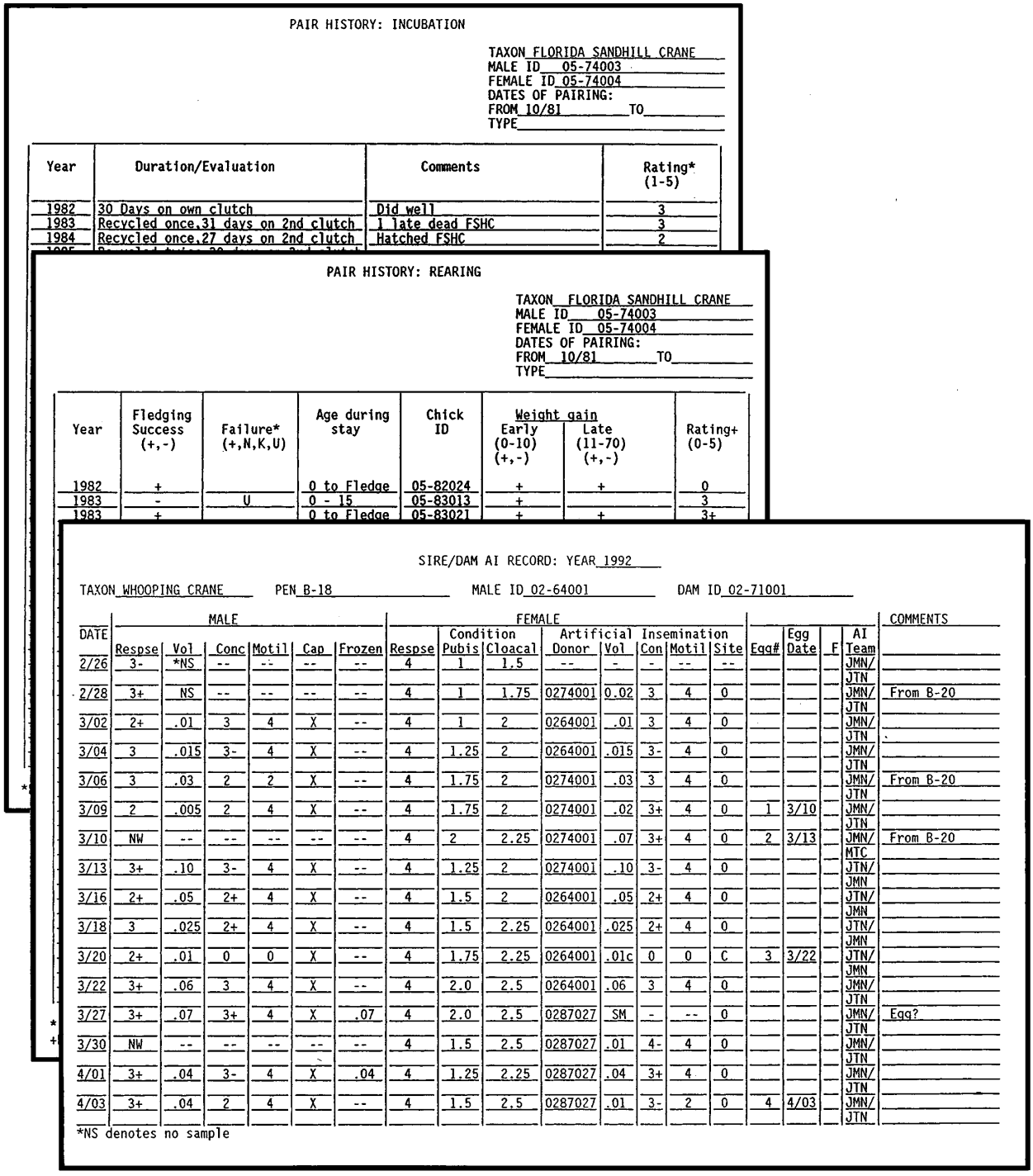
*Special drugs or prophylactic treatments as prescribed by veterinarian.

FIG. 10.3. *Chick rearing records, Forms B and C.*

This form should include details of pair formation. For example, the record should indicate whether the birds were removed from a flock as a result of naturally choosing each other as mates, or whether the pair resulted from penning a male and female side by side until favorable behavior was observed. Details of pen numbers and duration of stay should be indicated here. This form is filed by taxon and male ID. Pair histories of extant pairs are filed separately from records of former pairs.

E AND F. PAIR HISTORY: INCUBATION AND REARING. These forms (Fig. 10.4) provide a year-by-year evaluation of a pair's performance in incubation and chick rearing for the duration of the pair's existence. File by taxon and male ID.

G. SIRE/DAM ARTIFICIAL INSEMINATION RECORD. A detailed record (Fig. 10.4) is made for each bird involved in the AI program. This form is used to evaluate responses to AI and to provide the raw data for investigating topics such as timing of semen



PAIR HISTORY: INCUBATION

TAXON FLORIDA SANDHILL CRANE
MALE ID 05-74003
FEMALE ID 05-74004
DATES OF PAIRING:
FROM 10/81 TO
TYPE

Year	Duration/Evaluation	Comments	Rating* (1-5)
1982	30 Days on own clutch	Did well	3
1983	Recycled once,31 days on 2nd clutch	1 late dead FSHC	3
1984	Recycled once,27 days on 2nd clutch	Hatched FSHC	2

PAIR HISTORY: REARING

TAXON FLORIDA SANDHILL CRANE
MALE ID 05-74003
FEMALE ID 05-74004
DATES OF PAIRING:
FROM 10/81 TO
TYPE

Year	Fledging Success (+,-)	Failure* (+,N,K,U)	Age during stay	Chick ID	Weight gain Early (0-10) (+,-)	Weight gain Late (11-70) (+,-)	Rating+ (0-5)
1982	+		0 to Fledge	05-82024	+	+	0
1983	-	U	0 - 15	05-83013	+		3
1983	+		0 to Fledge	05-83021	+	+	3+

SIRE/DAM AI RECORD: YEAR 1992

TAXON WHOOPING CRANE PEN B-18 MALE ID 02-64001 DAM ID 02-71001

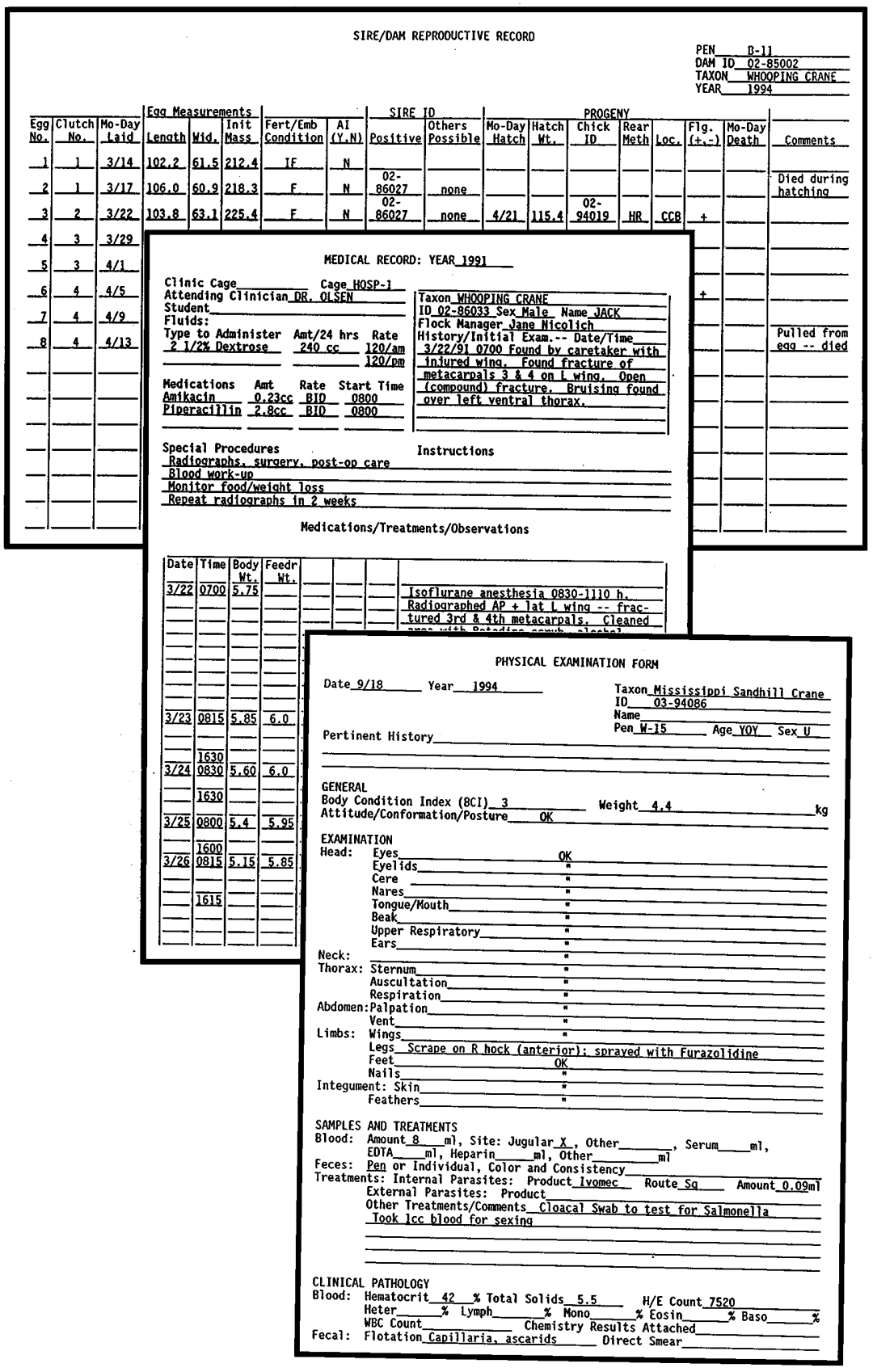
DATE	MALE Respse	Vol	Conc	Motil	Cap	Frozen	FEMALE Respse	Condition Pubis	Condition Cloacal	Artificial Insemination Donor	Vol	Con	Motil	Site	Egg#	Egg Date	F	AI Team	COMMENTS
2/26	3-	*NS	--	--	--	--	4	1	1.5	--	-	-	--	--				JMN/ JTN	
2/28	3+	NS	--	--	--	--	4	1	1.75	0274001	0.02	3	4	0				JMN/ JTN	From B-20
3/02	2+	.01	3	4	X	--	4	1	2	0264001	.01	3	4	0				JMN/ JTN	
3/04	3	.015	3-	4	X	--	4	1.25	2	0264001	.015	3-	4	0				JMN/ JTN	
3/06	3	.03	2	2	X	--	4	1.75	2	0274001	.03	3	4	0				JMN/ JTN	From B-20
3/09	2	.005	2	4	X	--	4	1.75	2	0274001	.02	3+	4	0	1	3/10		JMN/ JTN	
3/10	NW	--	--	--	--	--	4	2	2.25	0274001	.07	3+	4	0	2	3/13		JMN/ MTC	From B-20
3/13	3+	.10	3-	4	X	--	4	1.25	2	0274001	.10	3-	4	0				JTN/ JMN	
3/16	2+	.05	2+	4	X	--	4	1.5	2	0264001	.05	2+	4	0				JTN/ JMN	
3/18	3	.025	2+	4	X	--	4	1.5	2.25	0264001	.025	2+	4	0				JTN/ JMN	
3/20	2+	.01	0	0	X	--	4	1.75	2.25	0264001	.01c	0	0	C	3	3/22		JTN/ JMN	
3/22	3+	.06	3	4	X	--	4	2.0	2.5	0264001	.06	3	4	0				JMN/ JTN	
3/27	3+	.07	3+	4	X	.07	4	2.0	2.5	0287027	SM	-	--	0				JMN/ JTN	Egg?
3/30	NW	--	--	--	--	--	4	1.5	2.5	0287027	.01	4-	4	0				JMN/ JTN	
4/01	3+	.04	3-	4	X	.04	4	1.25	2.25	0287027	.04	3+	4	0				JMN/ JTN	
4/03	3+	.04	2	4	X	--	4	1.5	2.5	0287027	.01	3-	2	0	4	4/03		JMN/ JTN	

*NS denotes no sample

FIG. 10.4. *Some breeding records, Forms E-G.*

production, synchrony of mates, and suitability of AI techniques and paternity. Data is recorded for responses to AI, semen quality and quantity, and seasonal changes in the distance between pubic bones and condition of cloaca, both of which are indicators of the approach of egg laying (see Gee 1983 and Chapter llA). Sire/Dam AI Records are filed by year, taxon, and ID. The original copies of these forms, arranged by pen number, are included in a loose-leaf notebook that serves as an annual field log for AI.

H. SIRE/DAM REPRODUCTIVE RECORD. The Sire/Dam Reproductive Record (Fig. 10.5) provides a cumulative list, egg by egg, of the reproductive performance of each breeding pair. Not only can fertility



SIRE/DAM REPRODUCTIVE RECORD

PEN B-11
DAM ID 02-85002
TAXON WHOOPING CRANE
YEAR 1994

Egg No.	Clutch No.	Mo-Day Laid	Egg Measurements: Length	Wid.	Init Mass	Fert/Emb Condition	AI (Y,N)	SIRE ID: Positive	Others Possible	PROGENY: Mo-Day Hatch	Hatch Wt.	Chick ID	Rear Meth	Loc.	Flg. (+,-)	Mo-Day Death	Comments
1	1	3/14	102.2	61.5	212.4	IF	N										
2	1	3/17	106.0	60.9	218.3	F	N	02-86027	none								Died during hatching
3	2	3/22	103.8	63.1	225.4	F	N	02-86027	none	4/21	115.4	02-94019	HR	CCB	+		
4	3	3/29															
5	3	4/1															
6	4	4/5													+		
7	4	4/9															
8	4	4/13															Pulled from egg -- died

MEDICAL RECORD: YEAR 1991

Clinic Cage _____ Cage HOSP-1
Attending Clinician DR. OLSEN
Student _____
Fluids:
Type to Administer: 2 1/2% Dextrose — Amt/24 hrs: 240 cc — Rate: 120/am, 120/pm

Medications: Amikacin — Amt: 0.23cc — Rate: BID — Start Time: 0800
Piperacillin — Amt: 2.8cc — Rate: BID — Start Time: 0800

Taxon WHOOPING CRANE
ID 02-86033 Sex Male Name JACK
Flock Manager Jane Nicolich
History/Initial Exam.-- Date/Time 3/22/91 0700 Found by caretaker with injured wing. Found fracture of metacarpals 3 & 4 on L wing. Open (compound) fracture. Bruising found over left ventral thorax.

Special Procedures
Radiographs, surgery, post-op care
Blood work-up
Monitor food/weight loss
Repeat radiographs in 2 weeks

Instructions

Medications/Treatments/Observations

Date	Time	Body Wt.	Feedr Wt.				
3/22	0700	5.75					Isoflurane anesthesia 0830-1110 h. Radiographed AP + lat L wing -- fractured 3rd & 4th metacarpals. Cleaned
3/23	0815	5.85	6.0				
	1630						
3/24	0830	5.60	6.0				
	1630						
3/25	0800	5.4	5.95				
	1600						
3/26	0815	5.15	5.85				
	1615						

PHYSICAL EXAMINATION FORM

Date 9/18 Year 1994
Taxon Mississippi Sandhill Crane
ID 03-94086
Name
Pen W-15 Age YOY Sex U
Pertinent History

GENERAL
Body Condition Index (BCI) 3 Weight 4.4 kg
Attitude/Conformation/Posture OK

EXAMINATION
Head: Eyes OK
Eyelids "
Cere "
Nares "
Tongue/Mouth "
Beak "
Upper Respiratory "
Ears "
Neck: "
Thorax: Sternum "
Auscultation "
Respiration "
Abdomen: Palpation "
Vent "
Limbs: Wings "
Legs Scrape on R hock (anterior); sprayed with Furazolidine
Feet OK
Nails "
Integument: Skin "
Feathers "

SAMPLES AND TREATMENTS
Blood: Amount 8 ml, Site: Jugular X, Other _____, Serum ____ ml, EDTA ____ ml, Heparin ____ ml, Other ____ ml
Feces: Pen or Individual, Color and Consistency
Treatments: Internal Parasites: Product Ivomec Route Sq Amount 0.09ml
External Parasites: Product
Other Treatments/Comments Cloacal Swab to test for Salmonella
Took 1cc blood for sexing

CLINICAL PATHOLOGY
Blood: Hematocrit 42 % Total Solids 5.5 H/E Count 7520
Heter ____ % Lymph ____ % Mono ____ % Eosin ____ % Baso ____ %
WBC Count ____ Chemistry Results Attached
Fecal: Flotation Capillaria, ascarids Direct Smear

FIG. 10.5. *Some breeding and medical records, Forms H, J, and K.*

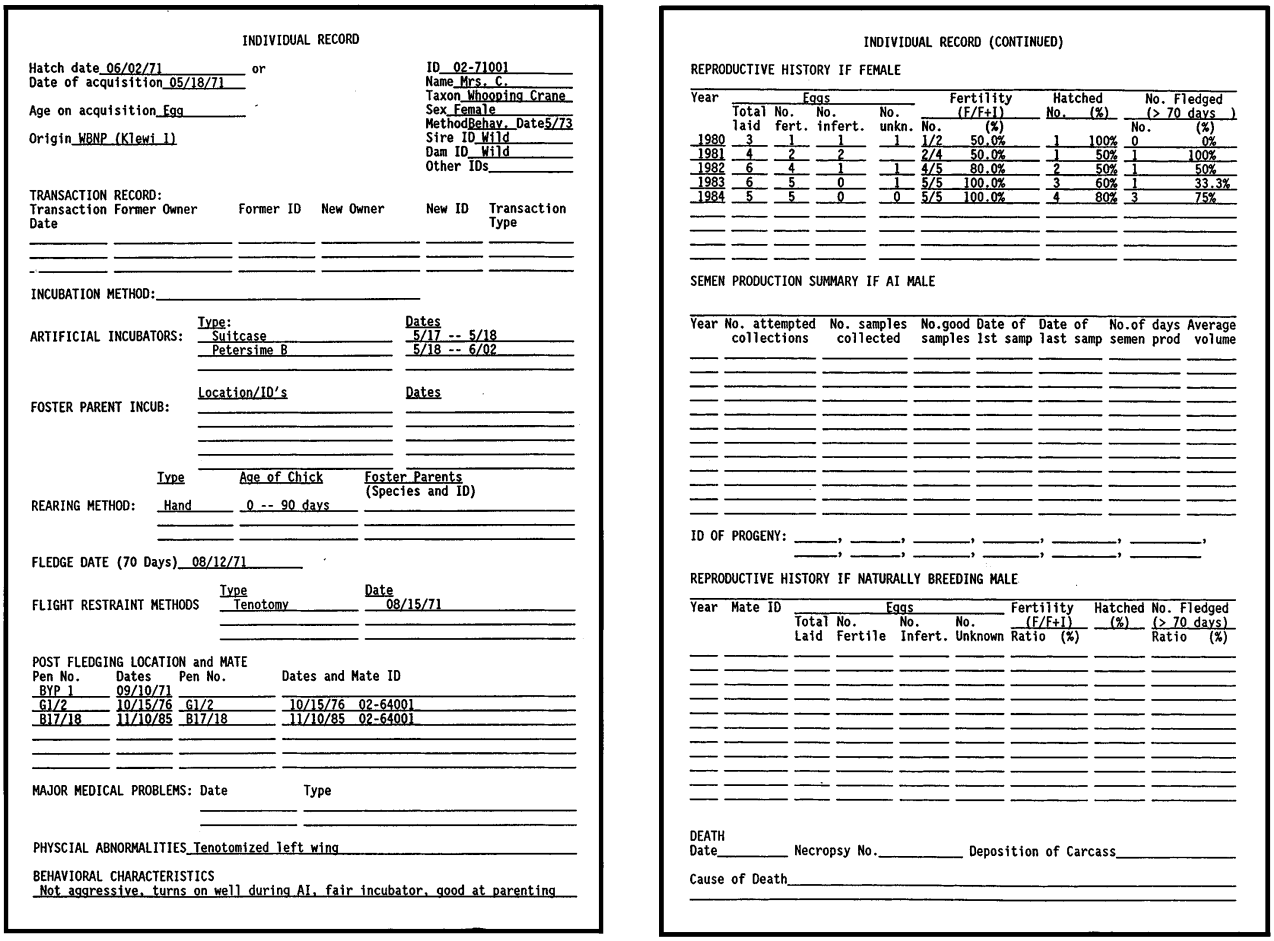
and hatchability be evaluated from this form, but any aberrance in progeny survival is also apparent. This form is prepared throughout the breeding season in conjunction with the Egg Cards (A), Egg Logs (HH), and Sire/Dam AI Records (G), and is filed by year, taxon, and ID.

I. NECROPSY RECORD. On this form, record details of the post-mortem examination and histopathological tests. IC's provide: location and time of death, weight, general body condition, a brief medical history, anatomical abnormalities, and name of performing pathologist. The form lists tissues and other materials retained, carcass deposition, information on diagnosis, and, where possible, cause of death. We recommend the tabular separation of the most frequent causes of death for ease in data extraction. This form is filed by taxon and ID. A copy may also be placed in the Mortality File in the Individual File.

J. MEDICAL RECORD. For chicks, the Hand-reared (B) or Parent-reared Chick: Daily Log (C) serves as a medical record. For a fledged bird, a separate Medical Record (Fig. 10.5) is created when the bird first shows clinical signs requiring veterinarian care. Medical Records include treatment instructions, a summary of treatments, and personnel involved in patient care as well as a description of the injury or disease. File by taxon and ID, with live bird records filed separately from dead. Copies of the Medical Record of dead birds are included in the Mortality File, which becomes part of the Individual File, and also with other medical records.

K. PHYSICAL EXAMINATION RECORD. In the fall of the year, each bird is given a physical examination (annual health check). This record (Fig. 10.5) is filed by taxon and ID for living birds, and like other medical records of dead birds, it is placed in the Mortality File in the Individual File.

L. INDIVIDUAL RECORD. The Individual Record (Fig. 10.6) provides an overview of the life of an individual crane as well as an index to all other



INDIVIDUAL RECORD

Hatch date 06/02/71 or
Date of acquisition 05/18/71
Age on acquisition Egg
Origin WBNP (Klewi 1)

ID 02-71001
Name Mrs. C.
Taxon Whooping Crane
Sex Female
Method Behav. Date 5/73
Sire ID Wild
Dam ID Wild
Other IDs

TRANSACTION RECORD:

Transaction Date	Former Owner	Former ID	New Owner	New ID	Transaction Type

INCUBATION METHOD:

	Type:	Dates
ARTIFICIAL INCUBATORS:	Suitcase	5/17 -- 5/18
	Petersime B	5/18 -- 6/02

	Location/ID's	Dates
FOSTER PARENT INCUB:		

	Type	Age of Chick	Foster Parents (Species and ID)
REARING METHOD:	Hand	0 -- 90 days	

FLEDGE DATE (70 Days) 08/12/71

	Type	Date
FLIGHT RESTRAINT METHODS	Tenotomy	08/15/71

POST FLEDGING LOCATION and MATE

Pen No.	Dates	Pen No.	Dates and Mate ID
BYP 1	09/10/71		
G1/2	10/15/76	G1/2	10/15/76 02-64001
B17/18	11/10/85	B17/18	11/10/85 02-64001

MAJOR MEDICAL PROBLEMS: Date Type

PHYSCIAL ABNORMALITIES Tenotomized left wing

BEHAVIORAL CHARACTERISTICS
Not aggressive, turns on well during AI, fair incubator, good at parenting

INDIVIDUAL RECORD (CONTINUED)

REPRODUCTIVE HISTORY IF FEMALE

Year	Eggs: Total laid	Eggs: No. fert.	Eggs: No. infert.	Eggs: No. unkn.	Fertility (F/F+I): No.	Fertility (F/F+I): (%)	Hatched: No.	Hatched: (%)	No. Fledged (> 70 days): No.	No. Fledged (> 70 days): (%)
1980	3	1	1	1	1/2	50.0%	1	100%	0	0%
1981	4	2	2		2/4	50.0%	1	50%	1	100%
1982	6	4	1	1	4/5	80.0%	2	50%	1	50%
1983	6	5	0	1	5/5	100.0%	3	60%	1	33.3%
1984	5	5	0	0	5/5	100.0%	4	80%	3	75%

SEMEN PRODUCTION SUMMARY IF AI MALE

Year	No. attempted collections	No. samples collected	No. good samples	Date of 1st samp	Date of last samp	No. of days semen prod	Average volume

ID OF PROGENY: _____, _____, _____, _____, _____, _____,
_____, _____, _____, _____, _____, _____

REPRODUCTIVE HISTORY IF NATURALLY BREEDING MALE

Year	Mate ID	Eggs: Total Laid	Eggs: No. Fertile	Eggs: No. Infert.	Eggs: No. Unknown	Fertility (F/F+I): Ratio	Fertility (F/F+I): (%)	Hatched (%)	No. Fledged (> 70 days): Ratio	No. Fledged (> 70 days): (%)

DEATH
Date _____ Necropsy No. _____ Deposition of Carcass _____

Cause of Death _____

FIG. 10.6. *Individual Record, Form L.*

records where this bird appears as an individual. Details of various phases of the crane's life are kept on more specific records (discussed later). This and several other records are filed by taxon and ID in the Individual File. Separate files are maintained for dead or dispersed birds.

Daily Working Records

Daily logs or reports are useful for immediate communication between staff and to temporarily record information while working at sites remote from the records room. At ICF, a daily log is used year round and supplemented with a chick report during the breeding season. At Patuxent, the following daily work records are used.

M. Daily Log. Animal caretakers make a preliminary record of husbandry activities in the Daily Log. Thereafter, many details (such as pen-to-pen moves, unusual behavioral observations, and injuries or illnesses) are transferred to the Individual Log (R) or specific record sheets, but the Daily Log from each year is retained and filed chronologically. This is the only record of many routine activities.

N. Incubator/Hatcher Daily Record. This form (Fig. 10.7) provides a log of mechanical incubator and hatcher temperature and humidity conditions. Typically, readings are taken 2-4 times per day. These reports are filed chronologically and by machine number.

O. Natality Sheet. This form (Fig. 10.7), a chronological list of all natalities, is used to assign ID numbers to chicks at hatching time. Entries are made manually as each chick hatches and the form can be generated by computer from Sire/Dam Reproductive Records. Filing is by year with the Egg Cards (A) or chick hatching records.

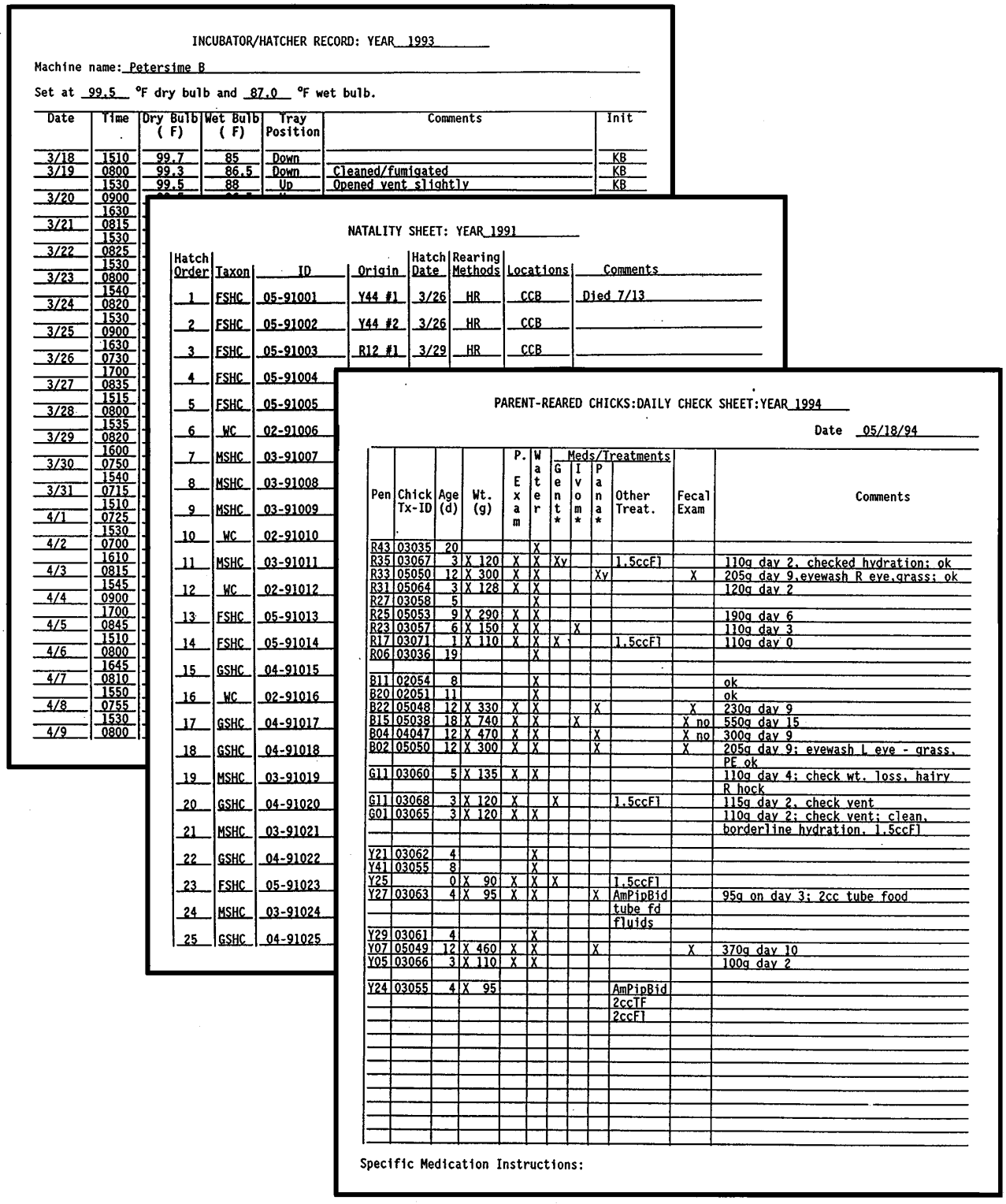
P. Parent-Reared Chicks: Daily Check Sheet. One copy of this form (Fig. 10.7) is used each day as the chick care teams travel through the colony to examine and/or provide medical treatments to all chicks being reared by crane pairs. After the tour through the collection, the information for each chick is transferred to the appropriate Parent-Reared Chick: Daily Log (C). Thereafter, a Daily Check Sheet is prepared for the next day by transferring information from the previous day's Daily Check Sheet and the examination/medication schedule on the Parent-Reared Chick: Daily Log (C). These forms are filed chronologically by year.

Q. Breeding Pairs: Daily Check Sheet (Walk Through Sheet). This check sheet (Fig. 10.8) is prepared daily for the caretaker to use while walking through the crane colony to inspect each pair, record nest condition, determine the number of eggs or chicks, and to evaluate nest attendance and other adult behavior. One copy of the form is sufficient for 70 pairs. At the end of the day, information on egg and chick numbers is transferred to the form for the following day. This form is used in planning egg moves and in rating each pair's incubation and rearing performance at the end of the breeding season.

R. Individual Log. A running log of events, from fledging to death, pertaining to the individual is kept on this form (Fig. 10.8). The information is later transferred to more specific records such as Individual Record (L), Pair History: Behavior (D), and Medical Record (J). This log is filed in the Individual File.

S. Veterinary Logs. Three log books provide a chronological record of veterinary activities. First, for each mortality, the Necropsy Log includes postmortem findings, samples (cultures and other materials), fate of carcass, and diagnosis. Second, the Radiology Log indexes the radiograph files, and third, the Laboratory Log reports detailed results of microbial cultures, fecal examinations, blood tests, etc. Filing is chronological by year for each log.

T. Accession Book. The Accession Book (Fig. 10.8) is the most fundamental record kept for an animal colony. Akin to the specimen catalog for a museum, it is a cumulative log of all cranes that have been or are a part of the collection. Various taxa can be logged in different books, or more commonly, all are logged in the same book, chronologically, according to arrival date or hatching or fledging date (for chicks originating at the facility). All birds that reach fledging age are included, but chicks that die before fledging may or may not be included. Birds that are owned by the institution but housed elsewhere are also included. Accession book records can be easily maintained on ARKS III.



INCUBATOR/HATCHER RECORD: YEAR 1993

Machine name: Petersime B

Set at 99.5 °F dry bulb and 87.0 °F wet bulb.

Date	Time	Dry Bulb (F)	Wet Bulb (F)	Tray Position	Comments	Init
3/18	1510	99.7	85	Down		KB
3/19	0800	99.3	86.5	Down	Cleaned/fumigated	KB
	1530	99.5	88	Up	Opened vent slightly	KB
3/20	0900					
	1630					
3/21	0815					
	1530					
3/22	0825					
	1530					
3/23	0800					
	1540					
3/24	0820					
	1530					
3/25	0900					
	1630					
3/26	0730					
	1700					
3/27	0835					
	1515					
3/28	0800					
	1535					
3/29	0820					
	1600					
3/30	0750					
	1540					
3/31	0715					
	1510					
4/1	0725					
	1530					
4/2	0700					
	1610					
4/3	0815					
	1545					
4/4	0900					
	1700					
4/5	0845					
	1510					
4/6	0800					
	1645					
4/7	0810					
	1550					
4/8	0755					
	1530					
4/9	0800					

NATALITY SHEET: YEAR 1991

Hatch Order	Taxon	ID	Origin	Hatch Date	Rearing Methods	Locations	Comments
1	FSHC	05-91001	Y44 #1	3/26	HR	CCB	Died 7/13
2	FSHC	05-91002	Y44 #2	3/26	HR	CCB	
3	FSHC	05-91003	R12 #1	3/29	HR	CCB	
4	FSHC	05-91004					
5	FSHC	05-91005					
6	WC	02-91006					
7	MSHC	03-91007					
8	MSHC	03-91008					
9	MSHC	03-91009					
10	WC	02-91010					
11	MSHC	03-91011					
12	WC	02-91012					
13	FSHC	05-91013					
14	FSHC	05-91014					
15	GSHC	04-91015					
16	WC	02-91016					
17	GSHC	04-91017					
18	GSHC	04-91018					
19	MSHC	03-91019					
20	GSHC	04-91020					
21	MSHC	03-91021					
22	GSHC	04-91022					
23	FSHC	05-91023					
24	MSHC	03-91024					
25	GSHC	04-91025					

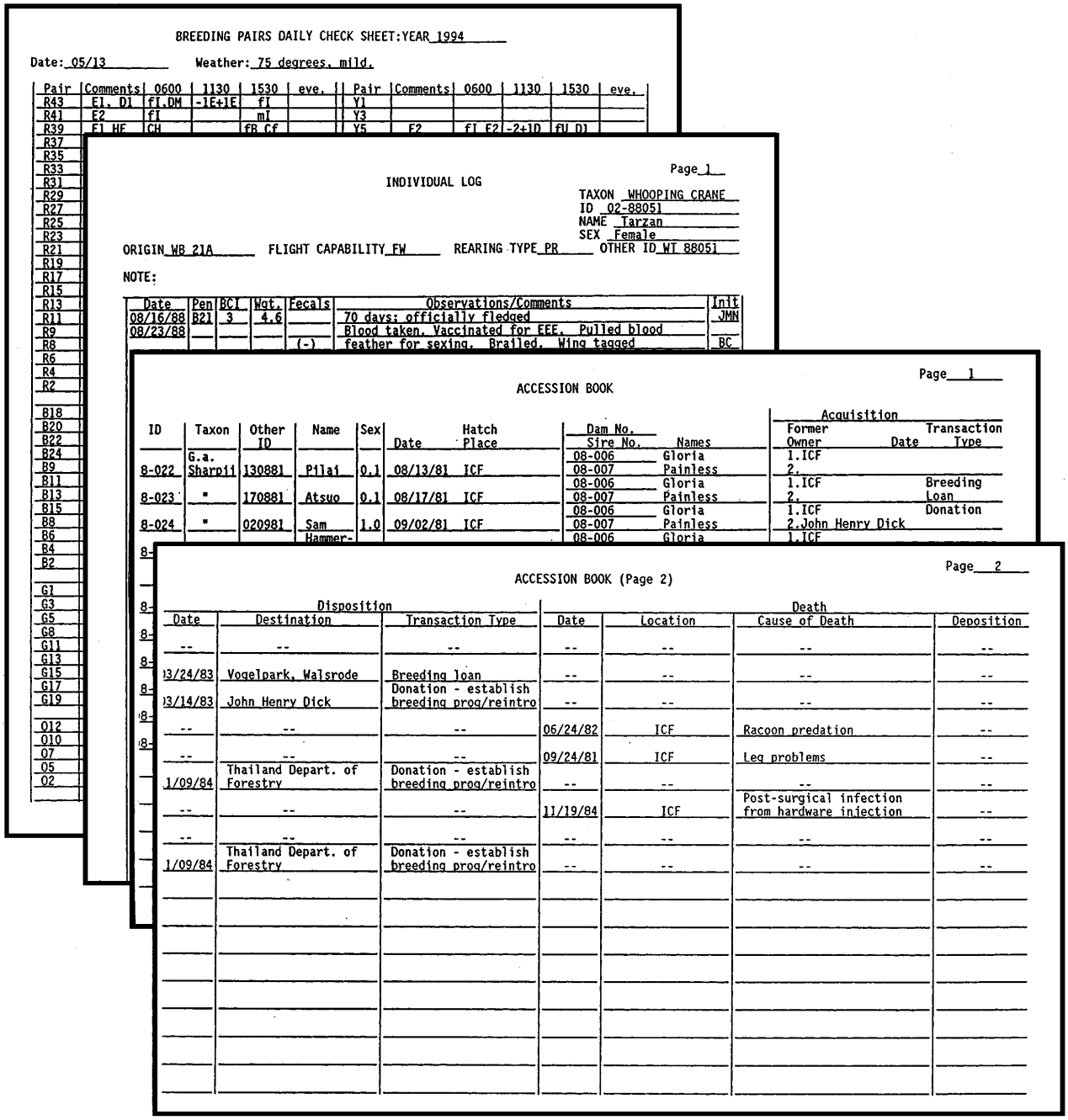
PARENT-REARED CHICKS:DAILY CHECK SHEET:YEAR 1994

Date 05/18/94

Pen	Chick Tx-ID	Age (d)	Wt. (g)	P. Exam	Water	Meds/Treatments: Gent*	Ivom*	Pana*	Other Treat.	Fecal Exam	Comments
R43	03035	20			X						
R35	03067	3	X 120	X	X	Xy			1.5ccFl		110g day 2, checked hydration: ok
R33	05050	12	X 300	X	X			Xy		X	205g day 9,evewash R eye,grass: ok
R31	05064	3	X 128	X	X						120g day 2
R27	03058	5			X						
R25	05053	9	X 290	X	X						190g day 6
R23	03057	6	X 150	X	X		X				110g day 3
R17	03071	1	X 110	X	X	X			1.5ccFl		110g day 0
R06	03036	19			X						
B11	02054	8			X						ok
B20	02051	11			X						ok
B22	05048	12	X 330	X	X			X		X	230g day 9
B15	05038	18	X 740	X	X		X			X no	550g day 15
B04	04047	12	X 470	X	X			X		X no	300g day 9
B02	05050	12	X 300	X	X			X		X	205g day 9; evewash L eye - grass, PE ok
G11	03060	5	X 135	X	X						110g day 4; check wt. loss, hairy R hock
G11	03068	3	X 120	X		X			1.5ccFl		115g day 2, check vent
G01	03065	3	X 120	X	X						110g day 2; check vent; clean, borderline hydration, 1.5ccFl
Y21	03062	4			X						
Y41	03055	8			X						
Y25		0	X 90	X	X	X			1.5ccFl		
Y27	03063	4	X 95	X	X			X	AmPipBid		95g on day 3; 2cc tube food
									tube fd		
									fluids		
Y29	03061	4			X						
Y07	05049	12	X 460	X	X			X		X	370g day 10
Y05	03066	3	X 110	X	X						100g day 2
Y24	03055	4	X 95						AmPipBid		
									2ccTF		
									2ccFl		

Specific Medication Instructions:

FIG. 10.7. *Some daily working records, Forms N-P.*



BREEDING PAIRS DAILY CHECK SHEET:YEAR 1994

Date: 05/13 Weather: 75 degrees, mild.

Pair	Comments	0600	1130	1530	eve.	Pair	Comments	0600	1130	1530	eve.
R43	E1, D1	fI,DM	-1E+1E	fI		Y1					
R41	E2	fI		mI		Y3					
R39	E1 HE	CH		fB Cf		Y5	E2	fI E2	-2+1D	fU D1	
R37											
R35											
R33											
R31											
R29											
R27											
R25											
R23											
R21											
R19											
R17											
R15											
R13											
R11											
R9											
R8											
R6											
R4											
R2											
B18											
B20											
B22											
B24											
B9											
B11											
B13											
B15											
B8											
B6											
B4											
B2											
G1											
G3											
G5											
G8											
G11											
G13											
G15											
G17											
G19											
O12											
O10											
O7											
O5											
O2											

Page 1

INDIVIDUAL LOG

TAXON WHOOPING CRANE
ID 02-88051
NAME Tarzan
SEX Female

ORIGIN WB 21A FLIGHT CAPABILITY FW REARING TYPE PR OTHER ID WT 88051

NOTE:

Date	Pen	BCI	Wgt.	Fecals	Observations/Comments	Init
08/16/88	B21	3	4.6		70 days; officially fledged	JMN
08/23/88					Blood taken. Vaccinated for EEE. Pulled blood feather for sexing. Brailed. Wing tagged	
				(-)		BC

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ACCESSION BOOK

ID	Taxon	Other ID	Name	Sex	Hatch Date	Hatch Place	Dam No. / Sire No.	Names	Acquisition Former Owner	Acquisition Date	Transaction Type
	G.a.						08-006	Gloria	1.ICF		
8-022	Sharpii	130881	Pilai	0.1	08/13/81	ICF	08-007	Painless	2.		
							08-006	Gloria	1.ICF		Breeding
8-023	"	170881	Atsuo	0.1	08/17/81	ICF	08-007	Painless	2.		Loan
							08-006	Gloria	1.ICF		Donation
8-024	"	020981	Sam	1.0	09/02/81	ICF	08-007	Painless	2.John Henry Dick		
			Hammer-				08-006	Gloria	1.ICF		

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ACCESSION BOOK (Page 2)

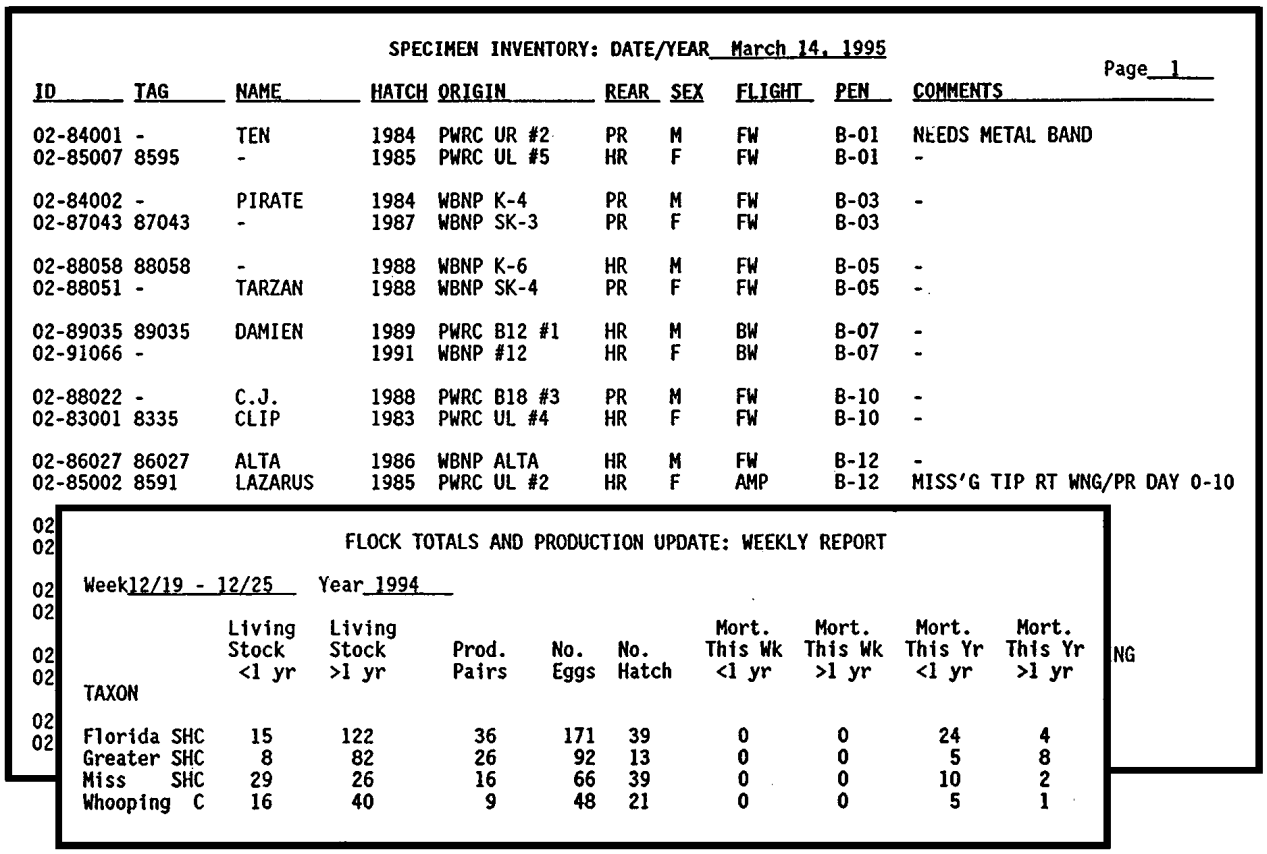
Disposition Date	Disposition Destination	Disposition Transaction Type	Death Date	Death Location	Death Cause of Death	Death Deposition
--	--	--	--	--	--	--
13/24/83	Vogelpark, Walsrode	Breeding loan	--	--	--	--
13/14/83	John Henry Dick	Donation - establish breeding prog/reintro	--	--	--	--
--	--	--	06/24/82	ICF	Racoon predation	--
--	--	--	09/24/81	ICF	Leg problems	--
1/09/84	Thailand Depart. of Forestry	Donation - establish breeding prog/reintro	--	--	--	--
--	--	--	11/19/84	ICF	Post-surgical infection from hardware injection	--
--	--	--	--	--	--	--
1/09/84	Thailand Depart. of Forestry	Donation - establish breeding prog/reintro	--	--	--	--

FIG. 10.8. *Additional daily working records, Forms Q, R, and T.*

Summary Records

These records provide an overview of the colony and facilitate long-term management of a crane flock. All collections should have a system that, at least annually, summarizes flock size, acquisitions (births and transfers in), and dispositions (or depositions, i.e., deaths and transfers out). Patuxent uses the following records.

U. SPECIMEN/PEN INVENTORY (MONTHLY REPORT). For each taxon, an automated Specimen Inventory (Fig. 10.9) is updated and prepared monthly. Individual birds of a taxon are listed by ID number, except for paired females who are listed immediately after their mates. A copy of this inventory is carried by caretakers when returning birds to pens and when locating an individual in the colony. A second automated version of this data, the Pen



SPECIMEN INVENTORY: DATE/YEAR March 14, 1995

Page 1

ID	TAG	NAME	HATCH	ORIGIN	REAR	SEX	FLIGHT	PEN	COMMENTS
02-84001	-	TEN	1984	PWRC UR #2	PR	M	FW	B-01	NEEDS METAL BAND
02-85007	8595	-	1985	PWRC UL #5	HR	F	FW	B-01	-
02-84002	-	PIRATE	1984	WBNP K-4	PR	M	FW	B-03	-
02-87043	87043	-	1987	WBNP SK-3	PR	F	FW	B-03	
02-88058	88058	-	1988	WBNP K-6	HR	M	FW	B-05	-
02-88051	-	TARZAN	1988	WBNP SK-4	PR	F	FW	B-05	-
02-89035	89035	DAMIEN	1989	PWRC B12 #1	HR	M	BW	B-07	-
02-91066	-		1991	WBNP #12	HR	F	BW	B-07	-
02-88022	-	C.J.	1988	PWRC B18 #3	PR	M	FW	B-10	-
02-83001	8335	CLIP	1983	PWRC UL #4	HR	F	FW	B-10	-
02-86027	86027	ALTA	1986	WBNP ALTA	HR	M	FW	B-12	-
02-85002	8591	LAZARUS	1985	PWRC UL #2	HR	F	AMP	B-12	MISS'G TIP RT WNG/PR DAY 0-10

FLOCK TOTALS AND PRODUCTION UPDATE: WEEKLY REPORT

Week 12/19 - 12/25 Year 1994

TAXON	Living Stock <1 yr	Living Stock >1 yr	Prod. Pairs	No. Eggs	No. Hatch	Mort. This Wk <1 yr	Mort. This Wk >1 yr	Mort. This Yr <1 yr	Mort. This Yr >1 yr
Florida SHC	15	122	36	171	39	0	0	24	4
Greater SHC	8	82	26	92	13	0	0	5	8
Miss SHC	29	26	16	66	39	0	0	10	2
Whooping C	16	40	9	48	21	0	0	5	1

FIG. 10.9. *Two summary records, Forms U and V.*

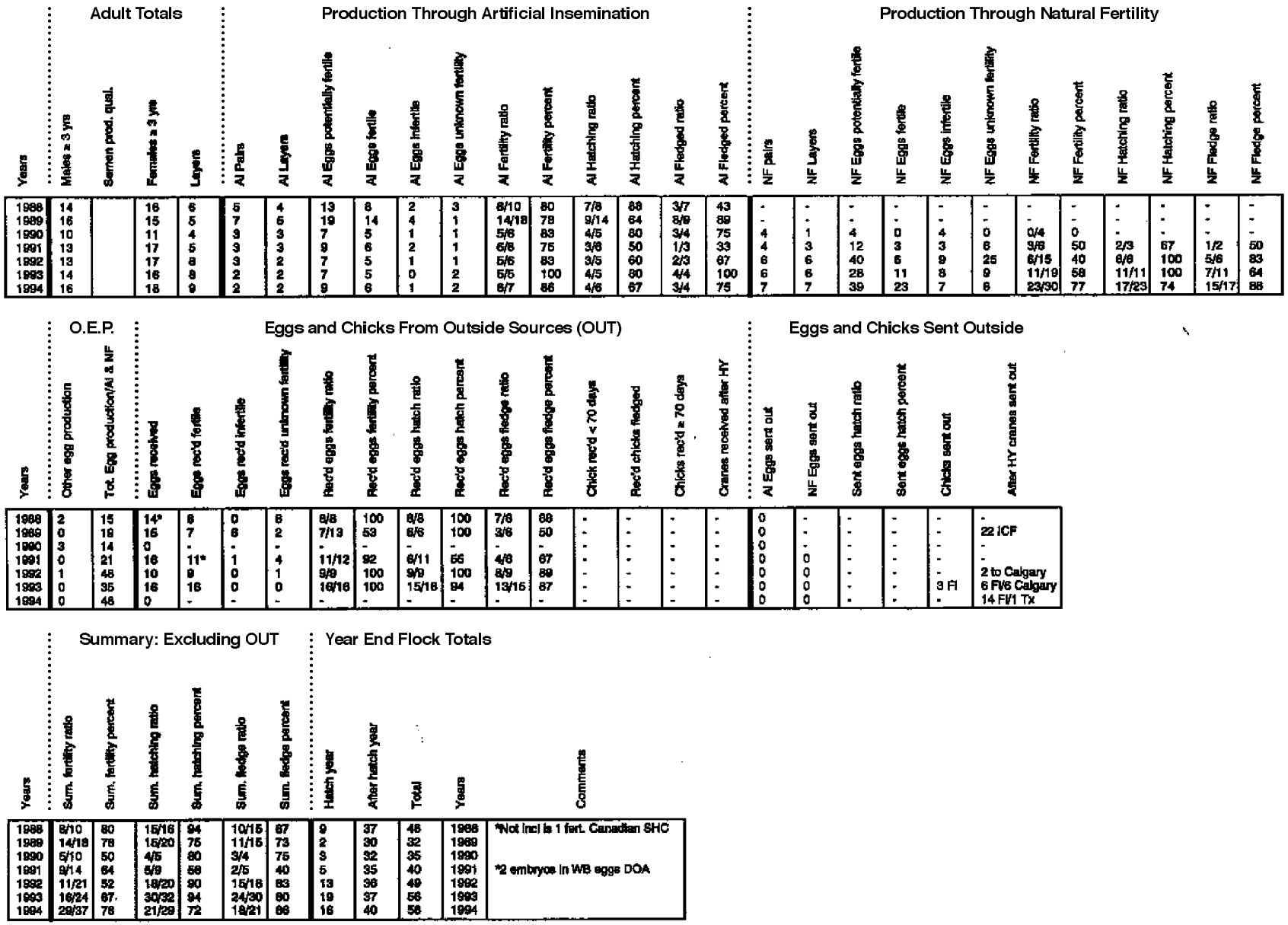
Inventory, is indexed by pen complex and pen number, with individuals in the same pen listed numerically by ID, or with paired females listed immediately after their mates. This is the version used each day while the caretaker walks through the colony to check that each bird is in the appropriate pen.

A copy of each monthly update is placed chronologically in the archives to act as a historical description of the colony. ARKS III provides its own Specimen Inventory as a report.

V. FLOCK TOTALS AND PRODUCTION UPDATE (WEEKLY REPORT). A weekly summary of flock size is prepared by balancing natality and acquisitions with mortality and departures. This report (Fig. 10.9) provides a summary for internal review and for informing cooperators of recent changes in captive colonies. The Weekly Report is our most useful document for reviewing egg production and chick survival during the breeding season. Weekly reports are filed chronologically.

W. PROPAGATION, IMMIGRATION, EMIGRATION AND POPULATION TABULATION (GIANT TABLE). The demography of a taxon within the colony is summarized for its entire history in the Giant Table (Fig. 10.10). Row headings are years. In our version, nearly 60 columns are divided into 7 major column groups. This table is updated at the end of each breeding season and is our most useful document for quickly summarizing demographic trends for each taxon within the colony.

X. ANNUAL PRODUCTION SUMMARY. This report (Fig. 10.11), prepared at the end of the breeding season, provides an annual summary of egg and chick production for each dam, whereas colony summaries are provided in W, above. This report combines all of the information from the individual Dam Reproduction Records (H) and Egg Cards (A). Filing is by taxon and year with the Sire/Dam Reproductive Records (H).



Years	Adult Totals: Males ≥ 3 yrs	Semen prod. qual.	Females ≥ 3 yrs	Layers	Production Through Artificial Insemination: AI Pairs	AI Layers	AI Eggs potentially fertile	AI Eggs fertile	AI Eggs infertile	AI Eggs unknown fertility	AI Fertility ratio	AI Fertility percent	AI Hatching ratio	AI Hatching percent	AI Fledged ratio	AI Fledged percent	Production Through Natural Fertility: NF pairs	NF Layers	NF Eggs potentially fertile	NF Eggs fertile	NF Eggs infertile	NF Eggs unknown fertility	NF Fertility ratio	NF Fertility percent	NF Hatching ratio	NF Hatching percent	NF Fledge ratio	NF Fledge percent
1988	14		16	6	5	4	13	8	2	3	8/10	80	7/8	88	3/7	43	-	-	-	-	-	-	-	-	-	-	-	-
1989	16		15	5	7	6	19	14	4	1	14/18	78	9/14	64	8/9	89	-	-	-	-	-	-	-	-	-	-	-	-
1990	10		11	4	3	3	7	5	1	1	5/6	83	4/5	80	3/4	75	4	1	4	0	4	0	0/4	0	-	-	-	-
1991	13		17	5	3	3	9	6	2	1	6/6	75	3/6	50	1/3	33	4	3	12	3	3	6	3/6	50	2/3	67	1/2	50
1992	13		17	8	3	2	7	5	1	1	5/6	83	3/5	60	2/3	67	6	6	40	6	9	25	6/15	40	6/6	100	5/6	83
1993	14		16	8	2	2	7	5	0	2	5/5	100	4/5	80	4/4	100	6	6	28	11	8	9	11/19	58	11/11	100	7/11	64
1994	16		18	9	2	2	9	6	1	2	6/7	86	4/6	67	3/4	75	7	7	39	23	7	6	23/30	77	17/23	74	15/17	88

Years	O.E.P.: Other egg production	Tot. Egg production/AI & NF	Eggs and Chicks From Outside Sources (OUT): Eggs received	Eggs rec'd fertile	Eggs rec'd infertile	Eggs rec'd unknown fertility	Rec'd eggs fertility ratio	Rec'd eggs fertility percent	Rec'd eggs hatch ratio	Rec'd eggs hatch percent	Rec'd eggs fledge ratio	Rec'd eggs fledge percent	Chick rec'd < 70 days	Rec'd chicks fledged	Chicks rec'd ≥ 70 days	Cranes received after HY	Eggs and Chicks Sent Outside: AI Eggs sent out	NF Eggs sent out	Sent eggs hatch ratio	Sent eggs hatch percent	Chicks sent out	After HY cranes sent out
1988	2	15	14*	6	0	6	6/6	100	6/6	100	7/6	88	-	-	-	-	0	-	-	-	-	-
1989	0	19	15	7	6	2	7/13	53	6/6	100	3/6	50	-	-	-	-	0	-	-	-	-	22 ICF
1990	3	14	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
1991	0	21	16	11*	1	4	11/12	92	6/11	55	4/6	67	-	-	-	-	0	0	-	-	-	-
1992	1	48	10	9	0	1	9/9	100	9/9	100	8/9	89	-	-	-	-	0	0	-	-	-	2 to Calgary
1993	0	35	16	16	0	0	16/16	100	15/16	94	13/15	87	-	-	-	-	0	0	-	-	3 FI	6 FI/6 Calgary
1994	0	48	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	14 FI/1 Tx

Years	Summary: Excluding OUT: Sum. fertility ratio	Sum. fertility percent	Sum. hatching ratio	Sum. hatching percent	Sum. fledge ratio	Sum. fledge percent	Year End Flock Totals: Hatch year	After hatch year	Total	Years	Comments
1988	8/10	80	15/16	94	10/15	67	9	37	46	1988	*Not incl is 1 fert. Canadian SHC
1989	14/18	78	15/20	75	11/15	73	2	30	32	1989	
1990	5/10	50	4/5	80	3/4	75	3	32	35	1990	
1991	9/14	64	5/9	56	2/5	40	5	35	40	1991	*2 embryos in WB eggs DOA
1992	11/21	52	18/20	90	15/18	83	13	36	49	1992	
1993	16/24	67	30/32	94	24/30	80	19	37	56	1993	
1994	29/37	78	21/29	72	19/21	86	16	40	56	1994	

FIG. 10.10. *Propagation, Immigration, Emigration, and Population Tabulation (Giant Table): Patuxent Whooping Crane data, Form W.*

10/07/94

1994 ANNUAL PRODUCTION REPORT
WHOOPING CRANE

Dam ID	Origin	Egg	Laid	Fert	AI	Hatch	Sire ID	Chick ID	Rear	RearLoc	Flg	Comment
02-85007	B-02	01	03/30/94	U	N	--	--	--	--	--	--	3/30 Broken
02-85007	B-02	02	04/04/94	F/ED	N	--	02-84001	--	--	--	--	--
02-85007	B-02	03	04/05/94	F	N	05/03/94	02-84001	02-94041	H	CCB	(+)	--
02-85007	B-02	04	04/11/94	F	N	05/10/94	02-84001	02-94054	P	B-11	(+)	--
02-85007	B-02	05	04/14/94	I	N	--	--	--	--	--	--	--
02-87043	B-04	01	03/17/94	U	N	--	--	--	--	--	--	3/21 Broken
02-87043	B-04	02	03/21/94	F	N	04/20/94	02-84002	02-94018	H	CCB	(+)	--
02-87043	B-04	03	03/26/94	F/LD	N	--	02-84002	--	--	--	--	--
02-87043	B-04	04	04/09/94	F	N	05/08/94	02-84002	02-94052	H	CCB	(+)	--
02-87043	B-04	05	04/11/94	I	N	--	--	--	--	--	--	--
02-83001	B-09	01	03/30/94	U	N	--	--	--	--	--	--	3/30 Broken
02-83001	B-09	02	04/04/94	U	N	--	--	--	--	--	--	4/04 Broken
02-83001	B-09	03	05/03/94	F/LD	N	--	02-88022	--	--	--	--	--
02-83001	B-09	04	05/03/94	U	N	--	--	--	--	--	--	5/03 Broken
02-85002	B-11	01	03/14/94	I	N	--	--	--	--	--	--	--
02-85002	B-11	02	03/17/94	F/LD	N	--	02-86027	--	--	--	--	--
02-85002	B-11	03	03/22/94	F	N	04/21/94	02-86027	02-94019	H	CCB	(+)	--
02-85002	B-11	04	03/29/94	I	N	--	--	--	--	--	--	--
02-85002	B-11	05	04/01/94	I	N	--	--	--	--	--	--	--
02-85002	B-11	06	04/05/94	F	N	05/04/94	02-86027	02-94045	H	CCB	(+)	--
02-85002	B-11	07	04/09/94	I	N	--	--	--	--	--	--	--
02-85002	B-11	08	04/13/94	F/LD	N	--	02-86027	--	--	--	--	5/09 Embryo pulled from egg
02-83004	B-13											
02-83004	B-13											caretaker
02-83004	B-13											
02-83004	B-13											
02-87042	B-15											
02-87042	B-15											
02-87042	B-15											ormed legs
02-87042	B-15											iated legs
02-87042	B-15											
02-87042	B-15											
02-71001	B-18											
02-71001	B-18											oned; Scoliosis
02-71001	B-18											liosis; resp

MORTALITY SUMMARY: YEAR 1987

No.	Taxon	Loc	ID	Origin	Htch Yr.	Sex	Death Date	Necrop No.	Deposit	Cause of Death
1	FSHC	R11	05-87005	R12 #4	1987	U	09/19	87216	Incin.	Found dead in pen in sleeping position
2	MSHC	G15	03-87064	G02 #6	1987	U	09/20	87217	Butler Bldg.	Found dead in pen in sleeping position
3	FSHC	CPF-02	05-85051	Y43 #2	1985	F	09/22	87221	Incin.	Found dead in pen
4	FSHC	Y17	05-87032	Y32 #3	1987	U	09/23	87222	Incin.	Found dead -- dehydration
5	FSHC	IP4	05-87018	R42 #4	1987	U	09/24	87224	Incin.	Found dead in pen
6	FSHC	IP4	05-87021	Rock#4	1987	U	09/25	87226	Incin.	Found dead in pen
7	WC	B01	02-67001	WBNPS2	1967	M	09/25	87225	Butler Bldg.	Died at Hospital
8	FSHC	CPF-02	05-84035	R13 #1	1984	F	09/25	87228	Incin.	Found dead in pen
9	GSHC	Y11	04-82023	GL14C	1982	M	09/25	87227	Incin.	Died at Hospital
10	WC	B16	02-83009	Col-orado	1983	M	09/25	87229	Butler Bldg.	Died at Hospital
11	FSHC	CPF-02	05-80004	Rock#3	1980	M	09/26	87230	Incin.	Found dead in pen
12	WC	B02	02-83007	UL #1	1983	F	09/26	87232	Butler Bldg.	Died at Hospital
13	FSHC	CPF-02	05-84036	R08 #1	1984	U	09/27	87233	Incin.	Found dead in pen
14	GSHC	Y35	04-87040	GL6	1987	U	09/27	87234	Incin.	Ran into fence, broke neck
15	GSHC	QP2	04-50004	GLNWR	1987	F	09/27	87235	Incin.	Malnourished, dehydrated
16	FSHC	R15	05-82037	R04 #3	1982	M	10/02	87242	Incin.	Died at hospital
17	GSHC	QP2	04-50001	GLNWR	1987	M	10/05	87244	Incin.	Died from complications after asperating tube food
18	FSHC	Y34	05-87006	R44 #3	1987	U	10/16	87248	Incin.	Deteriorated physically after contaminated feed study
20	GSHC	CCB	04-85021	GL-01	1985	F	10/27	87250	Incin.	Deteriorated physically after contaminated feed study
21	FSHC	R39	05-87054	R42 #4	1987	U	11/04	87262	Incin.	Severe pneumonia
22	FSHC	CCB	05-85047	R24 #4	1985	F	11/15	87269	Incin.	Contaminated feed study
23	GSHC	CCB	04-85027	GL25B	1985	U	11/21	87270	Incin.	Contaminated feed study
24	FSHC	CCB	05-85038	R18 #2	1985	U	11/06	87263	Incin.	Contaminated feed study
25	GSHC	QP2	04-50002	GLNWR	--	M	12/16	87287	Incin.	Trauma -- dislocated lft leg
26	MSCH	IP2	03-87065	MSCNWR Weber	1987	U	12/21	97290	Butler Bldg.	Trauma -- found dead in pen

FIG. 10.11. *Two summary records, Forms X and AA.*

Y. Genealogical Summary. The genealogical records for each crane taxon are derived from Sire/Dam Reproductive Records and AI Records. An ancestral chart, similar to that used for humans and available from regional genealogical societies, is useful as a visual aid. This and other genealogical records for each individual bird are filed within the Individual File. Genealogical summaries can be produced by SPARKS software. Genealogical records, kept for all known captive individuals of a species in a studbook (e.g., Sheppard 1985 and Chapter 9), frequently include inbreeding coefficients.

Z. Semen Bank Inventory. This inventory system consists of a running log of samples entering the semen bank and a semen inventory file wherein all samples from an individual male are listed as they enter the bank. Detailed records on the handling of each sample (see Chapter 11B) are also made, but the essential details of semen quality, volume, cane number, location, and source are recorded on the inventory sheet for each donor. A separate record is also maintained for each cryopreservation tank. Column headings are taxon, ID, pen, date the sample was frozen, volume, location in tank, and comments.

Mortality File. Whenever a mortality occurs, the Mortality Summary (AA) is updated, and the Necropsy Record (I), Medical Record (J), Physical Examination Records (K), and all records in the Individual File are transferred to a Mortality File. Mortality Files are filed by year.

AA. Mortality Summary. Crane mortality is tabulated chronologically from the Necropsy Records and the Necropsy Log (one of the Veterinary Logs). At the beginning of each year, a new record is begun (Fig 10.11). Filing is by year. ARKS III can generate an inventory of all deceased birds.

BB. Carcass Inventory. A running list is kept of all carcasses by taxon. In addition, a tag, including death date, ID, and cause of death, is attached to each carcass. The Carcass Inventory includes data from the specimen tag, plus storage site, final deposition site, and necropsy number. This report is kept in the permanent files, however, for ease in data entry, a copy can be kept at the carcass storage site.

CC. Shipment Report. This is a running list of birds sent to or received from other institutions. Because it duplicates entries in the Accession Book (T), it may be unnecessary to keep this record (especially if the Accession Book is automated in ARKS III or otherwise). Column headings indicate date sent, taxon, ID's, recipient, and purpose of transfer.

DD. Veterinary Care Summary. From the records listed in the "medical" and "mortality" columns in Fig. 10.1, a Veterinary Care Summary can be prepared annually. Included are totals by sex and age class for surgical, diagnostic, and radiographic procedures, and for medications used. This provides an overview of significant medical activities for the year and can be used to identify trends and make recommendations for improved collection management. The MedARKS system also creates summary records sorted by time period, taxon, procedure, or problem, and is retrieved by key words.

Planning Records and Visual Aids

Wall-mounted charts or diagrams are useful in work areas to provide current information for management decisions. Patuxent has found the following visual aids useful. In addition to Patuxent's forms, ICF uses erasable boards or bulletin boards to display maps (of bird, pen, and egg locations), examination and treatment schedules for chicks, and a list of ongoing medical cases.

EE. Annual Time Line. This display board (Fig. 2.2) is a valuable aid in planning activities that occur for only a portion of the calendar year. By using different colors for the horizontal bars for each taxon, it is possible to display scheduled events for several taxa on one time line.

FF. Egg Laying Interval Record. The duration and timing of the egg laying period for each year and the intervals between eggs are summarized for each female in this report (Fig. 10.12). The timing of egg removal, important in assessing maximum productivity, should be indicated for each egg on the form (see Chapter 3). This form is filed by taxon, ID, and year.

GG. Egg Card Board. On this display board, each pen containing a pair of cranes, and each single but potentially productive female, is given a label. There are also separate labels on the board for each mechanical incubator. As eggs are laid, introduced, or removed, the Egg Cards (A) are affixed beneath the appropriate labels on the Egg Card Board. This board provides a quick update on the location of each egg in the breeding colony and each incubator. In conjunction with the Egg and Chick Board (MM), this board serves as one of the most useful visual aids in planning egg moves and other aspects of incubation.

EGG LAYING INTERVAL RECORD

TAXON Whooping Crane
ID 02-71001

Year	Total Eggs	Season Length	Last Egg	Date 1st Egg	Days between Eggs Nos. 1 - 11									
					2	3	4	5	6	7	8	9	10	11
1979	1	--	--	30 May	--	--	--	--	--	--	--	--	--	--
1980	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1981	5	31 days	11 June	16 May	2	9	2	13	--	--	--	--	--	--
1982	7	34 days	18 May	4 Apr	2	8	3	6	4	8	--	--	--	--
1983	8	42 days	14 May	2 Apr	2	14	7	4	9	3	--	--	--	--
1984	10	50 days	27 May	7 Apr	3	8	4	6	7	4	8	5	5	--
1985	6	45 days	21 May	6 Apr	2	10	19	3	11	--	--	--	--	--
1986	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1987	1	--	--	8 Apr	--	--	--	--	--	--	--	--	--	--
1988	3	22 days	20 Apr	29 Mar	3	19	--	--	--	--	--	--	--	--
1989	7	52 days	26 Apr	15 Mar	3	14	2	12	3	8	--	--	--	--
1990	4	39 days	25 Apr	17 Mar	14	13	12	--	--	--	--	--	--	--
1991	7	43 days	27 Apr	15 Mar	4	10	3	9	12	5	--	--	--	--
1992	6	37 days	16 Apr	10 Mar	3	9	12	12	5	8	--	--	--	--
1993	5	25 days	14 Apr	20 Mar	3	7	13	2	--	--	--	--	--	--
1994	6	35 days	25 Apr	21 Mar	2	8	4	8	13	--	--	--	--	--

FIG. 10.12. *Egg Laying Interval Record, Form FF.*

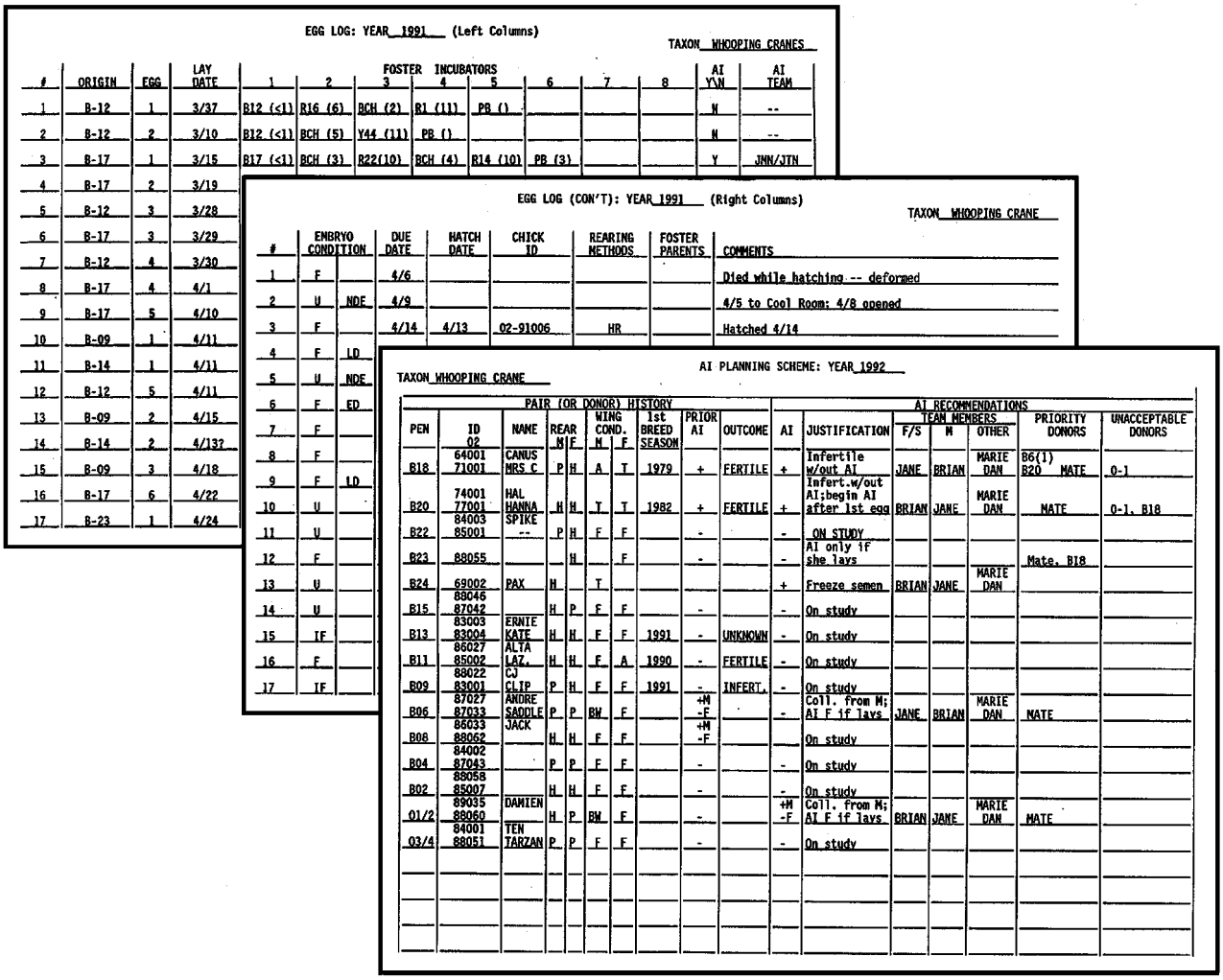
HH. EGG LOG. This record (Fig. 10.13) provides a chronological list of all eggs laid for each taxon. It is useful as a visual aid in the management of egg moves and in updating the Weekly Report (V). Data from these forms are used for productivity summaries.

II. EGG CHRONOLOGY BOARD. This aid can be used to follow the progress of a selection of the most valuable eggs (usually the eggs of endangered taxa). Column headings are dates. Rows are individual eggs. Each egg is represented by a 30-day-long adhesive strip affixed to the board. General events in the incubation of all eggs (e.g., timing of earliest vocalizations, entry into the air cell, pipping, hatch date, and chick ID) are printed on each strip. Egg locations are written on the strip following each egg move. Using the Egg Chronology Board, a caretaker can quickly determine location and stage in development of each egg.

JJ. HATCHER BOARD. When late-term eggs are moved from nests or artificial incubators to the hatcher, the Egg Cards (A) are affixed beneath the label for the appropriate hatcher on this display board.

KK. ARTIFICIAL INSEMINATION (AI) PLANNING SCHEME. A detailed breeding strategy for each individual in the colony is condensed into this form (Fig. 10.13). Copies are included for easy reference in the annual field log for AI. This record provides a useful, brief description of the pair history and AI recommendations. This form is filed by taxon and year with the Sire/Dam AI Records (G).

LL. OVIPOSITION AND INCUBATION CHRONOLOGY (GIANT CHECK SHEET). This large display form depicts the chronology of egg laying and egg moves for a breeding season. Column headings are days beginning with the date of the first egg of the season. Rows are either dam ID or pen numbers. All females of one taxa are grouped together with the first female to lay occupying the most elevated row. Data is transcribed to this check sheet directly from the Breeding Pairs: Daily Check Sheet (Q). An underlined check mark indicates the day oviposition occurred. A check mark indicates the pair is incubating. Eggs removed or added are indicated by plus or minus signs and numbers. For example, a two egg clutch removed to encourage a pair to lay again would be indicated by a "–2" in lieu of the check for that day. This form simplifies predicting when a pair is due to recycle (re-lay). The form is also useful in planning egg moves and in recycling pairs so that the best foster parents are in the proper reproductive state to receive eggs or chicks of endangered taxa. It is helpful to have each pair's incubation performance rating next to the dam ID or pen number. Hatch date and chick ID numbers are placed at the end of



EGG LOG: YEAR 1991 (Left Columns)

TAXON WHOOPING CRANES

#	ORIGIN	EGG	LAY DATE	FOSTER INCUBATORS 1	2	3	4	5	6	7	8	AI Y\N	AI TEAM
1	B-12	1	3/37	B12 (<1)	R16 (6)	BCH (2)	R1 (11)	PB ()				N	--
2	B-12	2	3/10	B12 (<1)	BCH (5)	Y44 (11)	PB ()					N	--
3	B-17	1	3/15	B17 (<1)	BCH (3)	R22(10)	BCH (4)	R14 (10)	PB (3)			Y	JNN/JTN
4	B-17	2	3/19										
5	B-12	3	3/28										
6	B-17	3	3/29										
7	B-12	4	3/30										
8	B-17	4	4/1										
9	B-17	5	4/10										
10	B-09	1	4/11										
11	B-14	1	4/11										
12	B-12	5	4/11										
13	B-09	2	4/15										
14	B-14	2	4/13?										
15	B-09	3	4/18										
16	B-17	6	4/22										
17	B-23	1	4/24										

EGG LOG (CON'T): YEAR 1991 (Right Columns)

TAXON WHOOPING CRANE

#	EMBRYO CONDITION		DUE DATE	HATCH DATE	CHICK ID	REARING METHODS	FOSTER PARENTS	COMMENTS
1	F		4/6					Died while hatching -- deformed
2	U	NDE	4/9					4/5 to Cool Room; 4/8 opened
3	F		4/14	4/13	02-91006	HR		Hatched 4/14
4	F	LD						
5	U	NDE						
6	F	ED						
7	F							
8	F							
9	F	LD						
10	U							
11	U							
12	F							
13	U							
14	U							
15	IF							
16	F							
17	IF							

AI PLANNING SCHEME: YEAR 1992

TAXON WHOOPING CRANE

PAIR (OR DONOR) HISTORY PEN	ID 02	NAME	REAR M	REAR F	WING COND. M	WING COND. F	1st BREED SEASON	PRIOR AI	OUTCOME	AI RECOMMENDATIONS AI	JUSTIFICATION	TEAM MEMBERS F/S	TEAM MEMBERS M	TEAM MEMBERS OTHER	PRIORITY DONORS	UNACCEPTABLE DONORS
	64001	CANUS									Infertile			MARIE	B6(1)	
B18	71001	MRS C	P	H	A	T	1979	+	FERTILE	+	w/out AI	JANE	BRIAN	DAN	B20 MATE	0-1
	74001	HAL									Infert.w/out AI;begin AI			MARIE		
B20	77001	HANNA	H	H	T	T	1982	+	FERTILE	+	after 1st egg	BRIAN	JANE	DAN	MATE	0-1, B18
	84003	SPIKE														
B22	85001	--	P	H	F	F		-		-	ON STUDY					
											AI only if					
B23	88055			H		F		-		-	she lays				Mate, B18	
														MARIE		
B24	69002	PAX	H		T					+	Freeze semen	BRIAN	JANE	DAN		
	88046															
B15	87042		H	P	F	F		-		-	On study					
	83003	ERNIE														
B13	83004	KATE	H	H	F	F	1991	-	UNKNOWN	-	On study					
	86027	ALTA														
B11	85002	LAZ.	H	H	F	A	1990	-	FERTILE	-	On study					
	88022	CJ														
B09	83001	CLIP	P	H	F	F	1991	-	INFERT.	-	On study					
	87027	ANDRE						+M			Coll. from M;			MARIE		
B06	87033	SADDLE	P	P	BW	F		-F		-	AI F if lays	JANE	BRIAN	DAN	MATE	
	86033	JACK						+M								
B08	88062		H	H	F	F		-F			On study					
	84002															
B04	87043		P	P	F	F		-		-	On study					
	88056															
B02	85007		H	H	F	F		-		-	On study					
	89035	DAMIEN								+M	Coll. from M;			MARIE		
01/2	88060		H	P	BW	F		-		-F	AI F if lays	BRIAN	JANE	DAN	MATE	
	84001	TEN														
03/4	88051	TARZAN	P	P	F	F		-		-	On study					

FIG. 10.13. *Some planning records and visual aids, Forms HH and KK.*

the row when the pair is no longer incubating. One form is generated each year and then filed chronologically.

MM. EGG AND CHICK BOARD. Using a ferric board and magnetic labels, this visual aid displays the number and taxon of eggs or chicks each pair is incubating or rearing. As for the Egg Card Board, each breeding pen is listed. Beneath each pen label, colored circles (eggs) and squares (chicks) indicate the appropriate number and taxa for eggs and chicks attended by each pair of foster parents. This visual aid is especially useful in planning egg and chick care during the period when many pairs of foster parents are in transition from incubation to chick rearing. By contrast, during incubation, the Oviposition and Incubation Chronology (LL) and the Egg Card Board (GG) are most useful.

NN. PATIENT BOARD. This display board is maintained at the hospital with a copy in the caretaker work area. It serves as a visual aid for use in caring for hospitalized cranes. On it, treatment instructions and other records pertinent to patient care are posted.

System Use

The 40 or so forms, files, notebooks, and display boards that comprise the Patuxent system provide a broad, detailed framework for the management of the most important data for a crane colony. Not all records need to be used by every institution. For example, if, at one institution, all eggs are mechanically incubated and all chicks are hand-reared, then

those records dealing with foster parent incubation (E, Q, LL, and MM), and foster parent rearing (C, F, P, and MM) are not used. If all propagation is through naturally fertile pairs, then all records dealing with artificial insemination (G, Z, and KK) can be eliminated.

The system can also be streamlined for use in very small crane colonies. Where few breeding pairs produce few eggs, many of the visual aids and production records become unnecessary. The most fundamental records are H, R, T, U, W, and AA. Little can be omitted from this nucleus of records without sacrificing the future usefulness of the colony. Because of the value of the records, we recommend that a duplicate copy be stored in a separate building.

Without actually using the system for a breeding season, it is difficult to understand the flow of information. Table 10.1, however, provides an overview of system use. Here, appropriate system responses are portrayed for some life history events of a foster parent-reared crane. When an egg hatches, for example, it is first recorded on the Breeding Pairs: Daily Check Sheet, then the Egg Card (A) is removed from the Egg Card Board (GG), and the hatching date and ID are placed on the Natality Sheet (O), Egg Card (A), Egg Chronology Board (II), Oviposition and Incubation Chronology (LL), Egg and Chick Board (MM), Dam Reproductive Record (H), and Egg Log (HH). A change is made on the chalk board, precursor of the Weekly Report (V), an entry is made in the Accession Book (T), and a Rearing Record (C) is created. Ultimately the Pair History Records (E and F), Specimen/Pen Inventory (U), Giant Table (W) and the Genealogical Summary (Y) must also be modified. All of these changes must be made by hand in a manual system. In a computer managed relational database, however, entry of the hatching event at one level will yield appropriate responses for all other records linked in the software matrix.

Patuxent's Automated Records System

At Patuxent, we have automated much of the records system presented here. We first experimented with the ISIS/ARKS program, but noted that at that time ARKS was unable to deal with the complex management of eggs. EGGS software, adapted from Patuxent's complex manual system, is being developed to operate with ARKS III. Another limitation of ARKS was that the details of life history events of the individual went into a general database named "Special Data" with the result that no relational manipulation was possible. Fortunately, home grown programs can be incorporated with ARKS III to perform this function (L. Bingaman Lackey, Hendersonville, North Carolina, personal communication).

One final drawback of ARKS was that Patuxent's ID numbers were incompatible to use as accession numbers, so separate accession numbers had to be assigned. ICF and most institutions have been able to use their ID numbers as the ARKS accession numbers. Because of the early inflexibility and limitations of the ISIS/ARKS system (now somewhat alleviated by the availability of MedARKS, SPARKS, and EGGS), Patuxent redesigned the manual system (Ellis et al. 1991) and began automation. Today about one-third of the IC's in the Patuxent system have been automated. There is no need to automate visual aids and many records in Figure 10.1. The records that should be automated are: Egg Card (A), Pair History: Incubation and Rearing (E,F), Sire/Dam Reproductive Record (H), Individual Record (L), Individual Log (R), Natality Sheet (O), Accession Book (T), Specimen/Pen Inventory (U), Weekly Report (V), Annual Production Summary (X), Genealogical Summary (Y) Mortality Summary (AA), Shipment Report (CC), Egg Laying Interval Record (FF), and Egg Log (HH). The following reports can be generated from retrieving data from other records and without additional data entry: Natality Sheet (O), Accession Book (T), Species/Pen Inventory (U), Weekly Report (V), Giant Table (W), Annual Production Summary (X), Shipment Report (CC), Egg Laying Interval Record (FF), Pair History: Incubation (E), Pair History: Rearing (G), Individual Record (L), Genealogical Summary (V), Mortality Summary (AA), and Egg Log (HH).

Record Keeping

The Patuxent system consists of a complex array of records linked through limited redundancy to provide for the systematic retention and collation of the data of interest in managing a large crane collection. The manual and automated systems are so closely linked that it is possible to use all or part of either without inordinate duplication of effort. The automation process is continuing. Hard copies of the individual form sheets are available from Patuxent.

TABLE 10.1

Immediate Responses to Some Natural History Events for a Parent-reared Crane[1]

		Oviposition	Hatching	Sickness Before Fledging	Death Before Fledging	Post Fledging Pen Moves	Pairing	Post Fledging Sickness	Post Fledging Death
A	Egg Card	5	3						
C	Parent-reared Chick: Daily Log		+	2	3				
D	Pair History: Behavior						4		
G	Sire/Dam AI Record	+							
H	Sire/Dam Reproductive Record	+	+		+				
I	Necropsy Record				+				+
J	Medical Record			+				+	
L	Individual Record					4	3		+
M	Daily Log					1	1	1	1
O	Natality Sheet		2						
P	Parent-reared Chicks: Daily Check Sheet		1	1	2				
Q	Breeding Pairs Daily Check Sheet	1	1		1				
R	Individual Log					3	2	+	+
S	Veterinary Logs			+	+			+	+
T	Accession Book		+		+				+
U	Specimen/Pen Inventory				+	2			+
V	Weekly Report	+	+		+				+
AA	Mortality Summary				+				+
HH	Egg Log	+	+		+				
II	Egg Chronology Board	3	4						
LL	Oviposition and Incubation Chronology	2	5		4				
MM	Egg and Chick Board	4	6		5				
NN	Patient Board							+	

[1] *Numbers (e.g., 1, 2, 3…) indicate order of responses. A plus (+) indicates that responses can be in any order.*

ICF's system is designed for relative simplicity and ability to integrate information with other institutions through ISIS/ARKS. Centralized individual files contain essentially all of an individual's records. ICF has developed a simple, computerized-text system for recording behavioral events. Important behavioral and reproductive milestones for the individual are also recorded in ARKS III. MedARKS is used for medical records, and copies are placed in the individual files. Annual summaries are produced and used for breeding objectives and reports.

Either system can be pared down for use with smaller collections or can be modified for use with other taxa. The use of such systems is essential to the long-term management of any crane colony intended for propagation or scientific research.

One final recommendation is of great importance. Although all animal care staff take and record information, each institution should designate one or two Record Keepers (or Registrars) who closely manage the entry of data into the automated system. At ICF, separate individuals handle ARKS and MedARKS records. Each Record Keeper should be fully familiar with the system, participate regularly in data entry, and serve as backup replacement in the event of loss of the other Record Keeper. However, a chief Record Keeper should oversee and control data entry to minimize errors in the data entry.

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